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SCHOOL OF MINES,

COLUMBIA COLLEGE.

1865-66.

SECOND EDITION.

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SCHOOL OF MINES,

COLUMBIA COLLEGE.

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TRUSTEES OF COLUMBIA COLLEGE.

NAMES.	RESIDENCES.
HAMILTON FISH, LL. D., Chairman of the Board	134 E. 17th Street.
GARDINER SPRING, S. T. D., LL. D.	13 West 37th "
SAMUEL B. RUGGLES, LL. D.	24 Union Square.
WILLIAM BETTS, LL. D., Clerk	122 E. 30th Street.
BENJAMIN I. HAIGHT, S. T. D.	56 West 26th "
EDWARD JONES	75 Fifth Avenue.
ROBERT RAY	221 W. 28th Street.
GOUVERNEUR M. OGDEN, Treas.,	187 Fulton St., h. 84 W. 11th St.
CHARLES KING, LL. D	New York.
HENRY J. ANDERSON, M. D., LL. D	New York.
EDWARD L. BEADLE, M. D	Poughkeepsie.
GEORGE T. STRONG	74 E. 21st Street.
MANCIUS S. HUTTON, S. T. D.	115 Ninth "
ALEXANDER W. BRADFORD, LL. D	9 E. 34th "
HORATIO POTTER, S. T. D., LL. D., D. C. L.	33 W. 24th "
MARTIN ZABRISKIE	Morrisania.
JOHN TORREY, M. D., LL. D	Columbia College.
LEWIS M. RUTHERFURD	175 Second Ave.
THOMAS DE WITT, S. T. D	123 Ninth Street.
JOHN JACOB ASTOR, Jr.	310 Fifth Avenue.
JOHN C. JAY, M. D	Rye.
WILLIAM C. SCHERMERHORN	49 W. 23d Street.
MORGAN DIX, S. T. D	50 Varick "
F. A. P. BARNARD, S. T. D., LL. D.	Columbia College.

COMMITTEE OF THE TRUSTEES

ON THE

SCHOOL OF MINES.

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EDWARD JONES	75 Fifth Avenue.
GEORGE T. STRONG	74 E. 21st Street.
JOHN TORREY, M. D., LL. D.	Columbia College.
LEWIS M. RUTHERFURD	175 Second Avenue.
FREDERICK A. P. BARNARD, S. T. D., LL. D.	Columbia College.
HAMILTON FISH, LL. D	134 E. 17th Street.

ASSOCIATE MEMBERS.

CORNELIUS R. AGNEW, M. D	394 Fifth Avenue.
GEORGE C. ANTHON	19 W. 39th Street.
SAMUEL W. BRIDGHAM	24 Waverley Place.
LEWIS L. DELAFIELD	475 Fifth Avenue.
FRANKLIN H. DELANO	39 Lafayette Place.
WILLIAM E. DODGE, JR	Madison Avenue.
JACOB P. G. FOSTER	56 W. 14th Street.
NATHANIEL P. HOSACK	15 W. 21st Street.
ROBERT L. KENNEDY	99 Fifth Avenue.
BARON ROBERT OSTENSACKEN	46 Clinton Place.
HOWARD POTTER	Astoria.
TEMPLE PRIME	113 W. 14th Street.
PERCY R. PYNE	44 South Street.
JAMES N. RENWICK	55 Ninth Street.
OTIS D. SWAN	29 Lafayette Place.
LUCIUS TUCKERMAN	22 Washington Pl.
GEORGE C. WARD	Staten Island.

OFFICERS.

FREDERICK A. P. BARNARD, S. T. D, LL. D. .Columbia College.
President.

THOMAS EGLESTON, Jr., A. M., E. M.........10 Fifth Avenue.
Professor of Mineralogy and Metallurgy.

FRANCIS L. VINTON, A. M... ....5 Grace Court, Brooklyn Heights.
Professor of Mining Engineering.

CHARLES F. CHANDLER, Ph. D................ 158 E. 33d Street.
Professor of Analytical and Applied Chemistry.
Dean of the Faculty.

JOHN TORREY, M. D., LL. D.................. Columbia College.
Lecturer on Botany.

CHARLES A. JOY, Ph. D...................... Columbia College.
Professor of General Chemistry.

WILLIAM G. PECK, LL. D..................... 29 Tenth Street.
Professor of Mechanics and Mining Surveying.

JOHN H. VAN AMRINGE, A. M .... Ravenswood.
Professor of Mathematics.

OGDEN N. ROOD, A. M......................... 128 E. 52d Street.
Professor of Physics.

ALBERT HUNTINGTON CHESTER........... 33 W. 44th Street.
Assistant in Mineralogy.

HENRY B. CORNWALL, A. B .... 508 Seventh Avenue.
Assistant in General Chemistry.

MILOS KROLIKOWSKI, C. E.................. 176 Bleecker Street.
Assistant in Drawing.

ALEXIS A. JULIEN, A. M...................... 81 E. 23d Street.
Assistant in Analytical Chemistry.

EDWARD W. ROOT, A. B............... ..... 205 W. 27th Street.
Assistant in Analytical Chemistry.

GEORGE M. MILLER, A. M............ ..... 165 W. 14th Street.
Assistant in Assaying.

STUDENTS.

NAMES.	RESIDENCE.	CITY ADDRESS.
John Magnus Adams, A. B.	New York City	123 East 13th Street.
Tom Ira Atwood	Hudson, N. Y.	34 Seventh Street.
Augustus Porter Barnard	New York City	56 East 20th Street.
Theodoret Bartow	Pelham, N. Y.	Pelham.
George Strong Baxter, A. B.	New York City	33 West 27th Street.
William Packer Bellamy	Brooklyn, N. Y.	Box 261, Brooklyn.
Ralph Wilcox Booth, Jr., A. B.	New York City	127 West 12th Street.
George Bradford Brainerd, C. E.	Brooklyn, N. Y.	21 Lafayette Place.
Samuel Willard Bridgham, Jr.	New York City	24 Waverley Place.
David Mathew Brown	Brooklyn, N. Y.	Brooklyn.
Francis Gordon Brown	Tarrytown, N. Y.	83 Beaver Street.
Robert P. Byrd	New York City	6 West 29th Street.
James Petigru Carson	Charleston, S. C.	149 West 26th Street.
Peter De Witt Chambers	Scarsdale, N. Y	Scarsdale, N. Y.
George Washington Chauncey	Brooklyn, N. Y.	Box 161 P. O., Brooklyn.
Albert Huntingdon Chester	Buffalo, N. Y.	33 West 44th Street.
John Adams Church	New York City	124 Lexington Avenue.
Walter Stewart Church	New York City	32 West 37th Street.
Henry Clay Clark	New York City	De Laneau House.
Henry Bedinger Cornwall, A. B.	New York City	508 Seventh Avenue.
George Hampton Coursen	New York City	66 West 19th Street.
George William Cranch	New York City	218 West 22d Street.
Oliver Eaton Cromwell	Rye, N. Y.	67 Madison Avenue.
William Stuart Duval	Brooklyn, N. Y.	8 Monroe Place.
Charles Butler Evarts	New York City	7 West 14th Street.
Lemuel Pitman Ferris	Mamaroneck, N. Y.	66 Wall Street.
George Jarvis Geer, Jr.	New York City	229 West 27th Street.
Edward Everett Giddings	Pierrepont Manor, N. Y.	69 West 44th Street.
Bryant Godwin	New York City	19 East 37th Street.
Charles King Gracie, A. B.	Elizabeth, N. J.	
John Louis Gross, Jr.	New York City	12 East 17th Street.
Albert Ward Hale, A. M.	New York City	243 Broadway, or 66 E. 17th St.
George Byron Hanna, A. B.	East Randolph, Mass.	1263 Broadway.
George Edward Harding	Bath, Maine	1127 Broadway.
Thomas Hays Harmer, A. B.	New York City	47 East 37th Street.
Nathan Hart	New York City	24 West 39th Street.

NAMES.	RESIDENCE.	CITY ADDRESS.
Robert Hay	New York City	105 Madison Avenue.
Charles Russel Hone	New York City	247 Fifth Avenue.
Frederick Erastus Hyde	New York City	39 West 34th Street.
Julian James, A. B.	Cold Spring, N. Y.	45 Wall Street.
Frederic Rhinelander Jones, A. B.	New York City	14 West 23d Street.
James Boggs Livingston	Rhinebeck, N. Y.	5 University Place.
Robert Cambridge Livingston	New York City	44 West 22d Street.
George Plume Lockwood	New York City	90 Macdougal Street.
Edward Whittlesey Lowery	Southington, Conn.	79 East 12th Street.
Archibald McMartin, A. B.	New York City	168 Fifth Avenue.
Samuel Holmes Mead, Jr.	New York City	233 West 34th Street.
Ernest Melliss	New York City	3 West 46th Street.
Henry Anthony Melly	New York City	63 St. Mark's Place.
Edward Stewart Moffat	Princeton, N. J.	21 Charlton Street.
Gouverneur Morris, Jr.	Morrisania, N. Y.	Morrisania, N. Y.
George Howland Parsons	Flushing, L. I.	Flushing, L. I.
Joseph Pope Pennington, A. B.	Newark, N. J.	
Frederic Milton Petit	Moira, N. Y.	69 West 44th Street.
William Pistor	New York City	436 West 22d Street.
Charles Slason Platt	Darien, Conn	
Gerald Lee Porter	New York City	197 East 19th Street.
William Powe	Ansonia, Conn.	141 West 36th Street.
Kenneth Robertson	New York City	278 Lexington Avenue.
Cornelius Roosevelt	New York City	39 East 12th Street.
John Howard Rutherford	Nyack, N. Y.	66 West 12th Street.
Albert Peter Schack	New York City	155 Madison Avenue.
Frederick Augustus Schermerhorn	New York City	61 University Place.
Thomas Parish Sherman	Newburgh, N. Y.	299 Fifth Avenue.
William Henry Julius Sieberg, A. B.	New York City	4 St. Mark's Place.
Lenox Smith, A. B.	New York City	299 West 21st Street.
Pierre Van Arsdale Smith	New York City	27 West 54th Street.
William Allen Smith	New York City	34 East 25th Street.
Frederick Stallknecht	New York City	133 West 46th Street.
Ledyard Stevens	Astoria, N. Y.	158 Pearl Street.
Isaiah W. Sylvester	New York City	115 West 44th Street.
Charles Symonds	St. Paul, Minnesota	Lexington Hotel.
McLeod Willson Thomson, A. B.	Chambersburgh, Penn.	394 Fifth Avenue.
William Wey Tuttle	New York City	118 Fifth Avenue.
William Henry Van Arsdale, A. B.	New York City	53 Seventh Street.
David Van Lennep	New York City	119 West 16th Street.
Seymour Van Nostrand, A. B.	New York City	243 West 42d Street.
Herman Voorhees	New York City	321 West 35th Street.
Moses Dillon Wheeler, Jr.	Zanesville, Ohio	153 East 51st Street.
Total		79

PRIZE STUDENTS.

1864-5.

CHEMISTRY.

JOHN HENRY CASWELL, A. B.,
JONATHAN ODELL FOWLER, A. B.,
THOMAS HAYS HARMER, A. B.,
FREDERIC PRIME, JR., A. B.

MINERALOGY.

JOHN MAGNUS ADAMS, A. B.,
FRANCIS GORDON BROWN,
ALBERT WARD HALE, A. M.

ONE-HUNDRED-DOLLAR PRIZE.

ALBERT WARD HALE, A. M.,
JOHN MAGNUS ADAMS, A. B.,
HENRY BEDINGER CORNWALL, A. B.

1865-6.

FREE ACADEMY PRIZE STUDENT.

WILLIAM HENRY JULIUS SIEBERG, A. B.

GENERAL STATEMENT.

The object of the School of Mines is to furnish to the student the means of acquiring a thorough scientific and practical knowledge of those branches of science which relate to mining and the working up of the mineral resources of this country, and to supply to those engaged in mining and metallurgical operations, persons competent to take charge of new or old works, and conduct them on thoroughly scientific principles.

The method of instruction is by lectures, given by the corps of professors; practice in the chemical and metallurgical laboratories; proposals and drawings for practice for the establishment of metallurgical works, and for mining; and reports of visits to metallurgical and other works.

Instruction is given in the following subjects:

ANALYTICAL GEOMETRY,
CALCULUS,
DESCRIPTIVE GEOMETRY,
MECHANICS,
MACHINES,
MINING,
MINING SURVEYING,
PHYSICS,
INORGANIC CHEMISTRY,
STOCHIOMETRY,
ANALYTICAL CHEMISTRY,
METALLURGY,
ASSAYING,
MINERALOGY,
GEOLOGY,
PALÆONTOLOGY,
BOTANY,
MACHINE AND MAP DRAWING,
CONSERVATION OF FORCE,
CONNECTION OF SCIENCES,
FRENCH,
GERMAN.

The whole course of instruction occupies three years. Those who complete it receive the degree of Engineer of Mines, or Bachelor of Philosophy. The year is divided into two terms. The first commences on the first Monday in October. The second commences the 15th of February, and closes on the first of June, with an examination of the studies of the year.

The method of instruction is such that every pupil may acquire a thorough theoretical knowledge of each branch, of which he is required to give evidence at the close of the session, by written and oral examinations. At the commencement of the following year he is required to show, from reports of works visited, that he not only understands the theoretical principles of the subjects treated, but also their practical application; a point that is insisted on with great rigor.

REQUIREMENTS FOR ADMISSION.

Students who wish to enter the school must not be less than sixteen years of age.

Candidates who enter for a degree must pass a satisfactory examination in Algebra, Geometry, and Trigonometry.

Candidates for advanced standing are examined in all the studies previously pursued by the classes which they propose to enter.

Arrangements can be made at the school for instruction in the preparatory studies.

The regular examinations for admission are held annually on the Monday and Tuesday before commencement, and on the Friday and Saturday preceding the first Monday in October. Candidates will, however, be examined *during the session*, whenever they may present themselves.

Those who are not candidates for a degree may, by a special arrangement, pursue any of the branches taught in the school, without previous examination.

COURSE OF INSTRUCTION.

FIRST YEAR.

FIRST SESSION.

Mathematics; Analytical Geometry of two and three dimensions.
Graphics; Elementary projections and Drawing.
Physics; Heat and the Steam Engine.
Inorganic Chemistry; Non-metallic elements.
Qualitative Analysis; Behavior of bases and acids with reagents.
Mineralogy; Crystallography and the use of the blowpipe.
German Language.
French Language.

SECOND SESSION.

Mathematics; Differential and Integral Calculus.
Graphics; Projections, Stone-Cutting, and Drawing.
Mining Surveying; Surface and Underground Surveying.
Physics; Electricity and Magnetism.
Inorganic Chemistry; Metals.
Qualitative Analysis; General testing.
Stochiometry; Problems on Equivalents, Reactions, etc.
Mineralogy; Blowpipe Analysis.
German Language.
French Language.

SECOND YEAR.

FIRST SESSION.

Mechanics; Mechanics of Solids, Liquids, and Gases.
Mining Engineering; Machines.
Quantitative Analysis; Analysis of substances of known composition.
Metallurgy; Copper and Lead.
Mineralogy; Description and Determination of Minerals.
Geology; Physiographic Geology, Lithology, and Historical Geology (begun).

SECOND SESSION.

MINING ENGINEERING; Machines.
QUANTITATIVE ANALYSIS; Analysis of ores, slags, technical products, etc.
METALLURGY; Lead, Silver, Zinc, Gold, Mercury, Nickel, Cobalt, and Platinum.
MINERALOGY; Description and Determination of Minerals.
GEOLOGY; Historical Geology (concluded), and Dynamical Geology.
BOTANY.

THIRD YEAR.

FIRST SESSION.

MINING ENGINEERING; Exploitation of Mines.
QUANTITATIVE ANALYSIS; Analysis of ores, slags, technical products, etc.
METALLURGY; Fuels, Furnaces, Iron.
ASSAYING; Ores of Lead, Silver, and Gold.
CONSERVATION OF FORCE.

SECOND SESSION.

MINING ENGINEERING; Exploitation of Mines.
QUANTITATIVE ANALYSIS; Analysis of ores, slags, technical products, etc.
METALLURGY; Iron and Steel.
ASSAYING; Ores of Copper, Tin, Antimony, Zinc, Nickel, Mercury, etc., and Bullion.
GEOLOGY; Theory of Veins.
CONNECTION OF SCIENCES.

TEXT-BOOKS.

Analytical Geometry.
Differential and Integral Calculus.
Descriptive Geometry.
Peck's Mechanics.
Silliman's Principles of Physics.
Fownes' Manual of Chemistry.
Cooke's Chemical Problems and Reactions.
Tuttle and Chandler's Qualitative Analysis.
Fresenius' Qualitative Analysis.
Fresenius' Quantitative Analysis.
Elderhorst's Blowpipe Analysis.
Dana's Manual of Geology.
Ahn's German Grammar.
French Grammar.

EXERCISES FOR PRACTICE.

DRAWING.

The first and second year is devoted to machine drawing.

During the third year, students are required to draw plans for metallurgical works and mining machinery. These plans are accompanied by a memoir, giving the reasons for their adoption, and the cost, in detail, of their execution. Each pupil will thus make, during his third year, plans applicable to the different cases he may meet with in practice.

SURVEYING.

Surface and underground work.

CHEMISTRY.

Manipulations in the chemical laboratory. During the first year the students are engaged in *qualitative* analysis; the second and third years are devoted to *quantitative* analysis. A detailed report of each quantitative analysis is required to be given in writing by each pupil.

ASSAYING.

The third year is spent by the pupils in the practice of assaying ores and metallurgical products, which they are required to do by the dry and wet way.

METALLURGY.

Examinations of ores and metallurgical products. A method of treatment is required to be given for each ore or *matte* examined; and in case the specimens examined should be the result of any derangement or accident, such as a slag containing too large a percentage of the metal, an opinion, in writing is required as to the best method of treating it.

MINERALOGY.

Manipulation of minerals, rocks, and metallurgical specimens. During the year mineralogical conferences are held by the professor of mineralogy, at which the students are required to determine minerals, either by their physical or blowpipe characters. Thorough instruction is given in crystallography and the use of the blowpipe.

GENERAL INFORMATION.

VACATIONS.

There is a vacation of two weeks for first year students, and of one month for second and third year students, in February. Also during the months of July, August, and September, for the whole school.

EXCURSIONS.

During the session, the students visit, with one of the professors, the different machine-shops and metallurgical establishments of the city and its environs.

During the vacation each student is expected to visit mining and metallurgical establishments, and to hand in, on his return, a journal of his travels, and a memoir on some subject assigned him. He is also required to bring collections, illustrating his journal and memoir, which collections are placed in the museum, reserved as a medium of exchange, or made use of in the laboratories.

For pupils who have been proficient, and who desire to devote special attention to any one branch, application will be made for permission to work in particular mines or manufactories. This will be done only as the highest reward of merit that the institution can give.

LIBRARY.

A library and reading-room have been provided for the use of the students of the school.

CABINETS.

Collections of specimens and models illustrating all the subjects taught in the school, are accessible to the students.

SCHOLARSHIPS.

During the past year a friend of the school guaranteed the sum of two hundred dollars per annum for three years, to meet the expenses of instruction, text-books, etc., in the School of Mines, of one student from the Free Academy, who was selected by examination.

Any person or corporation subscribing the sum of five thousand dollars to the school, will be entitled to have always one student in the school free of charge for tuition.

PRIZES.

At the close of the session of 1864–5, three prizes, of one hundred dollars each, were given by the same gentleman to the students who passed the best examination on the studies of the year.

Four prizes are offered by the same gentleman for the year 1865–6:

Fifty dollars to be awarded to the student of the first year who shall pass the best examination on the studies of the year.

Fifty dollars to the student of the second year who shall pass the best examination on the studies of the year.

Fifty dollars to the student of the third year who shall execute at the school the best flat-washed drawing.

One hundred dollars to the student of the third year who shall give the best method for working an ore of Lead containing Quartz, Zinc, and Copper. The method to be accompanied by drawings and specifications for the erection of the works.

Another friend of the school offers a prize of fifty dollars to the student of the first year who passes the best written and experimental examination in Qualitative Analysis.*

Also fifty dollars to the student of the school who gives evidence of the most thorough knowledge of the theory and practice of Quantitative Analysis.*

Any pupil of the third year who has been specially proficient in any one branch, may, if he wish, devote part of his time to it, under the direction of the professor of that branch, and may be attached as an assistant to one of the laboratories; in which case he will not be subject to the same regulations as the other students. This provision is made with the view of supplying unusual advantages to those students who have proved themselves worthy of it, and as an incentive to greater zeal in the prosecution of the studies of the course. Candidates for prizes will be required to pass an examination in French and German.

DEGREES.

The degree of Engineer of Mines or Bachelor of Philosophy, will be conferred on those students who pass satisfactory examinations. Certificates of proficiency will be given to those who pass a satisfactory examination in any one branch. Candidates for the degree of Doctor of Philosophy will be required to pass a special examination.

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* These prizes are called Torrey prizes in honor of Dr. John Torrey.

EXPENSES.

The fee for the full course is one hundred and sixty dollars per annum.

Those who wish to devote the whole of their time to chemistry and assaying, are charged one hundred and sixty dollars per annum for the use of the Laboratory. These fees are payable, one half on the first day of each season. A charge of five dollars is made for the diploma.

Students are supplied with apparatus, and charged for what they fail to return in good order.

CALENDAR.

1865.	November	15.	First session begins Wednesday.
	December	23.	Christmas holidays begin Saturday.
1866.	January	2.	Christmas holidays end Tuesday.
	Jan.	26.	First session ends Friday.
	February	15.	First year students return Thursday.
	March	1.	Second and third year students return Thursday.
	June	1.	Second session ends Friday.
	June	5.	Examinations commence Tuesday.
	June	25, 26.	Examination for admission, Monday and Tuesday.
	Sept.	28, 29.	Examination for admission, Friday and Saturday.
	October	1.	First session begins Monday.

SCHEME OF LECTURES,

FIRST SESSION.

NOV. 15, 1865 . . . JAN. 26, 1866.

FOR FIRST YEAR STUDENTS.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
9 to 10					
10 to 11	Mineralogy, Prof. EGLESTON.	Mineralogy, Prof. EGLESTON.			Inorganic Chemistry. Prof. JOY.
11 to 12	Physics, Professor ROOD.		Qualitative Analysis, Prof. CHANDLER.	Qualitative Analysis, Prof. CHANDLER.	Physics, Professor ROOD.
12 to 1	German, Professor Joy.	Inorganic Chemistry, Prof. JOY.	Descriptive Geometry, Prof. VINTON.	Inorganic Chemistry, Professor JOY.	German, Professor JOY.
1 to 2		Analytical Geometry Prof. VAN AMRINGE.	Analytical Geometry, Prof VAN AMRINGE		
2 to 3					Mineralogy, 1st Sec., Prof. EGLESTON.
3 to 4					Mineralogy, 2d Sec. Prof. EGLESTON.
4 to 5					

FOR SECOND YEAR STUDENTS.

9 to 10					
10 to 11	German, Professor JOY.	German, Professor JOY.	Conservation of Force, Pres. BARNARD.		Blowpipe Analysis, Prof. EGLESTON.
11 to 12	Blowpipe Analysis, Prof EGLESTON.	Mechanics, Professor PECK.	Machines, Professor VINTON.	Machines, Professor VINTON.	Quantitative Analysis. Prof. CHANDLER.
12 to 1	Metallurgy, Prof. EGLESTON.	Metallurgy, Prof. EGLESTON.		Mechanics. Professor PECK.	Mechanics Professor PECK.
1 to 2			Geology, Prof. CHANDLER.		Geology. Prof. CHANDLER
2 to 3				Metallurgy, Prof. EGLESON.	
3 to 4					
4 to 5					

FOR THIRD YEAR STUDENTS.

9 to 10					
10 to 11			Conservation of Force, Pres. BARNARD.		Blowpipe Analysis, Prof. EGLESTON.
11 to 12	Blowpipe Analysis, Prof. EGLESTON.	Mechanics, Professor PECK.	Machines, Prof. VINTON.	Machines, Professor VINTON.	Quantitative Analysis, Prof CHANDLER.
12 to 1	Metallurgy. Prof. EGLESTON.	Metallurgy, Prof. EGLESTON.		Mechanics. Professor PECK.	Mechanics. Professor PECK.
1 to 2				Assaying, Professor CHANDLER	
2 to 3				Metallurgy. Prof. EGLESTON.	
3 to 4					
4 to 5					

☞ Hours not occupied by Lectures are devoted to Laboratory Practice under Professor CHANDLER, assisted by Mr. JULIEN, Mr. ROOT, and Mr. MILLER; or to Drawing, under Professor VINTON, assisted by Mr. KROLIKOWSKI. Candidates for Degrees will be examined on all the Studies on this Scheme.

SCHEME OF LECTURES.

SECOND SESSION.

FEBRUARY 15, 1866 . . . JUNE 1, 1866.

FOR FIRST YEAR STUDENTS.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
9 to 10					
10 to 11	Calculus, Prof. VAN AMRINGE,	Physics, Professor ROOD.	Calculus, Prof. VAN AMRINGE.	Blowpipe Analysis, Mr. CHESTER.	Calculus, Prof. VAN AMRINGE.
11 to 12	Physics, Prof. ROOD.	German, Professor JOY.	Qualitative Analysis, Prof. CHANDLER.	Stochiometry, Prof. CHANDLER.	Mining Surveying, Professor PECK.
12 to 1	German, Professor JOY.	Inorganic Chemistry, Professor JOY.	Descriptive Geometry, Professor VINTON.	Stone-Cutting, Professor VINTON.	Inorganic Chemistry, Prof. JOY.
1 to 2	Blowpipe Analysis, Mr. CHESTER.		French, Professor VINTON.		
2 to 3					
3 to 4					
4 to 5					

FOR SECOND YEAR STUDENTS.

9 to 10					
10 to 11	Metallurgy, Prof. EGLESTON.	Metallurgy, Prof. EGLESTON.	Geology, Prof. CHANDLER.	Quantitative Analysis, Prof. CHANDLER.	Botany, Dr. TORREY.
11 to 12		Connection of Sciences, Pres. BARNARD.	Machines, Professor VINTON.	Machines, Professor VINTON.	Geology, Prof. CHANDLER.
12 to 1	Mineralogy, Prof. EGLESTON.	Mineralogy, Prof. EGLESTON.			
1 to 2					
2 to 3					
3 to 4					
4 to 5					

FOR THIRD YEAR STUDENTS.

9 to 10					
10 to 11	Metallurgy, Prof. EGLESTON.	Metallurgy, Prof. EGLESTON.		Quantitative Analysis, Prof. CHANDLER.	Assaying, Prof. CHANDLER.
11 to 12		Connection of Sciences, Pres. BARNARD.	Machines, Professor VINTON.	Machines, Professor VINTON.	
12 to 1	Mineralogy, Prof. EGLESTON	Mineralogy, Prof. EGLESTON.			
1 to 2					
2 to 3					
3 to 4					
4 to 5					

☞ Hours not occupied by Lectures are devoted to Laboratory Practice, under Professor CHANDLER, assisted by Mr. JULIEN, Mr. ROOT, and Mr. MILLER; or to Drawing, under Professor VINTON, assisted by Mr. KROLIKOWSKI. Candidates for Degrees will be examined on all the Studies on this Scheme.

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1866/67

SCHOOL OF MINES,

COLUMBIA COLLEGE.

1866–67.

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TRUSTEES OF COLUMBIA COLLEGE.

NAMES.	RESIDENCES.
HAMILTON FISH, LL. D., Chairman of the Board	134 East 17th Street.
GARDINER SPRING, S. T. D., LL. D	13 West 37th "
SAMUEL B. RUGGLES, LL. D	24 Union Square.
WILLIAM BETTS, LL. D., Clerk	122 East 30th Street.
BENJAMIN I. HAIGHT, S. T. D	56 West 26th "
EDWARD JONES	75 Fifth Avenue.
ROBERT RAY	221 West 28th Street.
GOUVERNEUR M. OGDEN, Treasurer	187 Fulton, h. 84 W. 11th "
CHARLES KING, LL. D	New York.
HENRY J. ANDERSON, M. D., LL. D	53 West 36th Street.
EDWARD L. BEADLE, M. D	Poughkeepsie.
GEORGE T. STRONG	74 East 21st Street.
MANCIUS S. HUTTON, S. T. D	115 Ninth "
ALEXANDER W. BRADFORD, LL. D	Office 6 Wall "
HORATIO POTTER, S. T. D., LL. D., D. C. L	38 East 22d "
MARTIN ZBOROWSKI	Morrisania.
JOHN TORREY, M. D., LL. D	Columbia College.
LEWIS M. RUTHERFURD	175 Second Avenue.
THOMAS DE WITT, S. T. D	123 Ninth Street.
JOHN JACOB ASTOR, Jr	310 Fifth Avenue.
JOHN C. JAY, M. D	Rye.
WILLIAM C. SCHERMERHORN	49 West 23d Street.
MORGAN DIX, S. T. D	50 Varick "
FREDERICK A. P. BARNARD, S. T. D., LL. D	Columbia College.

COMMITTEE OF THE TRUSTEES

ON THE

SCHOOL OF MINES.

NAMES.	RESIDENCES.
WILLIAM BETTS, LL. D., CHAIRMAN	122 East 30th Street.
EDWARD JONES	75 Fifth Avenue.
GEORGE T. STRONG	74 East 21st Street.
JOHN TORREY, M. D., LL. D	Columbia College.
LEWIS M. RUTHERFURD	175 Second Avenue.
FREDERICK A. P. BARNARD, S. T. D., LL. D.	Columbia College.
HAMILTON FISH, LL. D	134 East 17th Street.

ASSOCIATE MEMBERS.

CORNELIUS R. AGNEW, M. D	394 Fifth Avenue.
GEORGE C. ANTHON	19 West 39th Street.
SAMUEL W. BRIDGHAM	24 Waverley Place.
LEWIS L. DELAFIELD	475 Fifth Avenue.
FRANKLIN H. DELANO	39 Lafayette Place.
WILLIAM E. DODGE, JR.	Madison Avenue.
JACOB P. G. FOSTER	56 West 14th Street.
NATHANIEL P. HOSACK	15 West 21st “
ROBERT L. KENNEDY	99 Fifth Avenue.
BARON ROBERT OSTENSACKEN	46 Clinton Place.
HOWARD POTTER	
TEMPLE PRIME	113 West 14th Street.
PERCY R. PYNE	44 South “
JAMES N. RENWICK	55 Ninth “
OTIS D. SWAN	29 Lafayette Place.
LUCIUS TUCKERMAN	22 Washington Place.
GEORGE C. WARD	Staten Island.

OFFICERS.

FREDERICK A. P. BARNARD, S. T. D., LL. D. PRESIDENT.	Columbia College.
THOMAS EGLESTON, JR., A. M., E. M. Professor of Mineralogy and Metallurgy.	10 Fifth Avenue.
FRANCIS L. VINTON, E. M. Professor of Mining Engineering.	806 Broadway.
CHARLES F. CHANDLER, PH. D. Professor of Analytical and Applied Chemistry. Dean of the Faculty.	234 East 33d Street.
JOHN TORREY, M. D., LL. D. Lecturer on Botany.	Columbia College.
CHARLES A. JOY, PH. D. Professor of General Chemistry.	Columbia College.
WILLIAM G. PECK, LL. D. Professor of Mechanics and Mining Surveying.	37 Tenth Street.
JOHN H. VAN AMRINGE, A. M. Professor of Mathematics.	139 West 36th Street.
OGDEN N. ROOD, A. M. Professor of Physics.	128 East 52d Street.
JOHN S. NEWBERRY, M. D. Professor of Geology.	7 West 39th Street.
ALBERT HUNTINGTON CHESTER Assistant in Mineralogy.	72 West 20th Street.
FRITZ RINTELEN Assistant in General Chemistry.	Columbia College.
JOSEPH J. CASEY, A. B. Assistant in Drawing.	50 James Street.
ALEXIS A. JULIEN, A. M. Assistant in Analytical Chemistry.	81 East 23d Street.
EDWARD W. ROOT, A. M. Assistant in Analytical Chemistry.	130 West 26th Street.
PAUL SCHWEITZER Assistant in Analytical Chemistry.	153 West 43d Street.
EDWARD E. C. H. DAY Assistant in Assaying.	153 East 51st Street.
JULES MABRÜ Assistant in Metallurgy.	92 Third Avenue.
BENJAMIN HYDE BENTON Registrar.	Columbia College.

STUDENTS.

GRADUATING CLASS.

NAMES.	RESIDENCES.	CITY ADDRESS.
John Magnus Adams, A. B.	New York City	123 East 13th Street.
Edward Everett Giddings.	Pierrepont Manor, N. Y.	153 West 24th Street.
Albert Ward Hale, A. M	New York City	243 B'way, or 16 W. 14th St.
Thomas Hays Harmer, A. B.	New York City	113 East 37th Street.

THIRD YEAR STUDENTS.

NAMES.	RESIDENCES.	CITY ADDRESS.
Samuel Willard Bridgham, Jr.	New York City	24 Waverley Place.
Francis Gordon Brown	Tarrytown, N. Y.	72 Pine Street.
John Adams Church	New York City	124 Lexington Avenue.
William Stewart Duval.	Brooklyn, N. Y	8 Monroe Place.
Charles Butler Evarts	New York City	2 Washington Sq., north side
Charles King Gracie, A. B	New York City	22 Fifth Avenue.
Frederick Erastus Hyde	New York City	108 Second Avenue.
McLeod Willson Thomson, A. B	Chambersburg, Pa.	31 West 13th Street.
William Wey Tuttle	New York City	118 Fifth Avenue.
David Van Lennep	New York City	135 East 42d Street.

SECOND YEAR STUDENTS.

NAMES.	RESIDENCES.	CITY ADDRESS.
Tom Ira Atwood	Hudson, N. Y.	236 East 30th Street.
Augustus Porter Barnard	New York City	62 West 4th Street.
George Strong Baxter, A. B	New York City	207 Tenth Avenue.
James Pettigru Carson	Charleston, S. C.	149 West 26th Street.
Peter De Witt Chambers	Scarsdale, N. Y.	,
Albert Huntington Chester	Buffalo, N. Y	72 West 20th Street.
George Hampton Coursen	New York City	66 West 19th Street.

NAMES.	RESIDENCES.	CITY ADDRESS.
Oliver Eaton Cromwell	Rye, N. Y.	67 Madison Avenue.
Lemuel Pittman Ferris	Tarentum, Pa	Mamaroneck, N. Y.
George Jarvis Geer, Jr	New York City	229 West 27th Street.
John Louis Gross, Jr	New York City	12 East 17th Street.
George Byron Hanna, A. B.	East Randolph, Mass	140 West 16th Street.
Nathan Hart	New York City	24 West 39th Street
Robert Hay	New York City	105 Madison Avenue.
Julian James, A. B.	Cold Spring, N. Y.	27 West 24th Street.
Archibald MacMartin, A. B.	New York City	168 Fifth Avenue.
Samuel Holmes Mead, Jr	New York City	233 West 34th Street.
Edward Stewart Moffat	Princeton, N. J.	21 Charlton Street.
George Howland Parsons	Flushing, L. I.	
Joseph Pope Pennington, A. B.	Newark, N. J.	
William Pistor	New York City	436 West 22d Street.
Charles Slason Platt	Darien, Conn.	
Kenneth Robertson	Huntsville, Ala.	278 Lexington Avenue.
James Howard Rutherford	Nyack, N. Y.	66 West 12th Street.
Albert Peter Schack	New York City	155 Madison Avenue.
Frederick Augustus Schermerhorn	New York City	61 University Place.
William Henry Julius Sieberg, A. B.	New York City	104 Second Avenue.
Lenox Smith, A. B.	New York City	299 West 21st Street.
William Allen Smith	New York City	34 East 25th Street.
Frederick Stallknecht	New York City	133 West 46th Street.
William Henry Van Arsdale, A. B	New York City	53 Seventh Street.
Moses Dillon Wheeler, Jr	Zanesville, Ohio	322 East 54th Street.

FIRST YEAR STUDENTS.

NAMES.	RESIDENCES.	CITY ADDRESS.
Henry Pierrepont Bicknell	Riverdale, N. Y.	
Thomas Monahan Blossom, A. B.	New York City	197 Second Avenue.
Edward Stelle Brownson, A. B.	Brooklyn	127 Clinton St., Brooklyn.
Frederick Bruckman	New York City	1111 Second Avenue.
Alonzo Clarence Campbell	Detroit, Mich	193 East 33d Street.
Augustus Floyd Delafield, A. B.	New York City	2 East 17th Street.
Alfred Einhorn	New York City	126 West 40th Street.
Lewis Fink, Jr	New York City	338 West 35th Street.
William Augustus Hooker, A. B	Orange, N. J.	207 West 34th Street.
Gabriel Purdy Betts Hoyt	Brooklyn	Hall Street.
Chester Huntington, A. B.	Auburn, N. Y.	72 West 20th Street.
Robert Duer Irving	New Brighton, S. I.	

NAMES.	RESIDENCES.	CITY ADDRESS.
Walter Proctor Jenney	Fairhaven, Mass	927 Broadway.
Howard Kennedy, A. B.	Hagerstown, Md	67 Beaver Street.
George Plume Lockwood	Stamford, Conn	586 Broadway.
Thomas Harris Maxwell	Tuscaloosa, Ala	18 McDougal Street.
William Edgar Morris	New Rochelle, N. Y.	
Lionel Robert Nettre	Williamsburg, N. Y.	79 Ann Street.
Henry Newton, A. B.	New York City	26 West 21st Street.
Edward Moore Parrot	G'wood Works, Orange co. N. Y.	139 West 36th Street.
William Bleeker Potter, A. B.	New York City	38 East 22d Street.
John Cooper Randolph, A. B.	Jersey City	
Foster Thayer, A. M.	New York City	259 Fourth Avenue.
Henry Augustus Whiting, A. B.	New York City	66 West 12th Street.
Elliott Williams	Fordham, N. Y.	59 Broadway.

SPECIAL STUDENTS.

Pursuing a Partial Course.

NAMES.	RESIDENCES.	CITY ADDRESS.
Walter Baader	Switzerland	59 Pine Street.
Theodoret Bartow	Pelham, N. Y.	213 East 13th Street.
Richmond Curle Bateman	Brooklyn, N. Y.	Irving Hall
James William Beekman, Jr	New York City	5 East 34th Street.
Francis Du Bois, A. M., M. D.	Brooklyn	South 9th St., corner 6th St.
William Edward Bond	New York City	120 West 22d Street.
Ralph Wilcox Booth, Jr., A. B.	New York City	127 West 12th Street.
Robert Pettigrew Byrd	New York City	6 West 29th Street.
George Washington Chauncey	Brooklyn	97 Joralemon Street, B'klyn.
Charles Mott Coulter	New York City	138 East 19th Street.
George William Cranch	New York City	218 West 22d Street.
Clarence Gray Dinsmore	New York City	13 Brevort Place.
John Henry Ehlers	Fort Wayne, Ind	187 Sands Street, Brooklyn.
Edward Swan Fearing	New York City	29 Lafayette Place.
George Cornell Freeborn	New York City	18 East 41st Street.
Frederick Bartlett Goddard	New York City	7 Beekman Street.
James Romeyn Gregory, M. D.	New York City	153 East 51st Street.
Frederick Hahnemann Humphrey	Auburn, N. Y.	182 West 20th Street.
George Edward Harding	Bath, Me	Hoffman House.
Theodore Little, Jr	Morristown, N. J.	98 West 43d Street.
Robert Cambridge Livingston	New York City	44 West 22d Street.
Alfred Purdy Mead	New York City	74 Seventh Street.

NAMES.	RESIDENCES.	CITY ADDRESS.
HENRY ANTHONY MELLIJ	New York City	63 St. Mark's Place.
ERNEST MELLIS	New York City	3 West 46th Street.
CHARLES WURTZ MUSGRAVE	Bay Ridge, L. I.	
CARL WALWORTH NASON	New York City	51 East 20th Street.
JOHN ALSOP PAINE, Jr., A. M.	Newark, N. J.	13 West 46th Street.
JOHN PECK, Jr	New York City	388 Fifth Avenue.
WILLIAM POWE	Ansonia, Conn.	141 West 36th Street.
JOSIAH RILEY	Egan Canôr, Nevada	26 Pine Street.
FREDERICK SHERMAN	New York City	245 Fifth Avenue.
WALTER ROE SNIFFIN	New York City	5 East 42d Street.
JOHN JACOB TAYLOR	Newport, R. I.	29 Irving Place.
EDWARD LIVINGSTON TRUDEAU	New York City	48 West 15th Street.
WILLIAM SHAW WARD	Geneseo, N. Y.	153 East 51st Street.
ALMAR PRESTON WEBSTER	New York City	227 West 50th Street.
WILLIAM ALBERT WEED	New Orleans	16 Lexington Place.

[*Entered after the last Catalogue was Published; not now in the School.*]

LOUIS C. DE COPPET	New York City	
EDWARD CECILIUS HARTSINK DAY	Charmouth, Eng.	153 East 51st Street.
THOMPSON HART DOUGHTY	New York City	41 St. Mark's Place.
JOHN WASSON EDDY	New York City	214 West 14th Street.
HERMAN DEFOREST HALL	Nevada City, Col. T.	Reunn Hotel.
CHARLES ARTHUR HOYT	Cambridge, Mass.	
THEODORE T. H. MEYER	Staten Island	
ZEMON DE MORNEILLE	Mexico	
BENJAMIN CLAPP RIGGS, A. B.	New York City	33 West 17th Street.
ALBERT RUPE	New York City	
WILLIAM HENRY SANGER, A. B.	Yonkers	35 Liberty Street.
L. FAYETTE SYKES	New York City	
HENRY PARKHURST WELLS, A. B.	Brooklyn	84 Clinton Street, Brooklyn.

Graduating Class	4
Third Year Students	10
Second Year Students	32
First Year Students	25
Special Students	38
TOTAL	109

PRIZE STUDENTS.

1864-5.

CHEMISTRY.

JOHN HENRY CASWELL, A. B.,
JONATHAN ODELL FOWLER, A. B.,
THOMAS HAYES HARMER, A. B.,
FREDERIC PRIME, Jr., A. B.

MINERALOGY.

JOHN MAGNUS ADAMS, A. B.,
FRANCIS GORDON BROWN,
ALBERT WARD HALE, A. M.

ONE-HUNDRED-DOLLAR PRIZE.

ALBERT WARD HALE, A. M.,
JOHN MAGNUS ADAMS, A. B.,
HENRY BEDINGER CORNWALL, A. B.

1865-6.

FREE ACADEMY PRIZE STUDENT.

WILLIAM HENRY JULIUS SIEBERG, A. B.

FIFTY-DOLLAR PRIZE.

For the Best Examination on the Studies of the First Year.

GEORGE B. HANNA, A. B.

HONORABLY MENTIONED.

MOSES D. WHEELER,
ARCHIBALD McMARTIN, A. B.,
EDWARD STEWART MOFFAT,
WILLIAM HENRY VAN ARSDALE, A. B.

FIFTY-DOLLAR PRIZE.

For the Best Examination on the Studies of the Second Year.

DAVID VAN LENNEP.

TORREY PRIZES.

FIFTY DOLLARS.

For the Best Written and Experimental Examination on Qualitative Analysis.

GEORGE STRONG BAXTER, A. B.

HONORABLY MENTIONED.

MOSES D. WHEELER,
GEORGE B. HANNA, A. B.,
ARCHIBALD McMARTIN, A. B.,
EDWARD STEWART MOFFAT,
WILLIAM HENRY VAN ARSDALE, A. B.,
WILLIAM ALLEN SMITH.

FIFTY DOLLARS.

For the Most Thorough Knowledge of the Theory and Practice of Quantitative Analysis.

JOHN MAGNUS ADAMS, A. B.

HONORABLY MENTIONED.

HENRY B. CORNWALL, A. B.,
DAVID VAN LENNEP,
FRANCIS GORDON BROWN.

MINERALOGY.

Honorary Assistants appointed for having passed Best Examinations in Crystallography.

GEORGE B. HANNA, A. B.,
GEORGE STRONG BAXTER, A. B.,
WILLIAM HENRY VAN ARSDALE, A. B.,
MOSES D. WHEELER.

GENERAL STATEMENT.

The object of the School of Mines is to furnish to the student the means of acquiring a thorough scientific and practical knowledge of those branches of science which relate to mining and the working up of the mineral resources of this country, and to supply to those engaged in mining and metallurgical operations, persons competent to take charge of new or old works, and conduct them on thoroughly scientific principles.

The method of instruction is by lectures, given by the corps of professors; practice in the chemical and metallurgical laboratories; proposals and drawings for practice for the establishment of metallurgical works, and for mining; and reports of visits to metallurgical and other works.

Instruction is given in the following subjects:

ANALYTICAL GEOMETRY,
CALCULUS,
DESCRIPTIVE GEOMETRY,
MECHANICS,
MACHINES,
MINING,
MINING SURVEYING,
PHYSICS,
INORGANIC CHEMISTRY,
STOICHIOMETRY,
ANALYTICAL CHEMISTRY,
METALLURGY,
ASSAYING,
MINERALOGY,
GEOLOGY,
PALÆONTOLOGY,
BOTANY,
MACHINE AND MAP DRAWING,
CONSERVATION OF FORCE,
CONNECTION OF SCIENCES,
FRENCH,
GERMAN.

The whole course of instruction occupies three years. Those who complete it receive the degree of Engineer of Mines, or Bachelor of Philosophy. The year is divided into two terms. The first commences on the first Monday in October. The second commences the 15th of February, and closes on the first of June, with an examination on the studies of the year.

The method of instruction is such that every pupil may acquire a thorough theoretical knowledge of each branch, of which he is required to give evidence at the close of the session, by written and oral examinations. At the commencement of the following year he is required to show, from reports of works visited, that he not only understands the theoretical principles of the subjects treated, but also their practical application; a point that is insisted on with great rigor.

REQUIREMENTS FOR ADMISSION.

Students who wish to enter the school must not be less than sixteen years of age.

Candidates who enter for a degree must pass a satisfactory examination in Algebra, Geometry, and Plane and Analytical Trigonometry.

Graduates of Colleges and Schools of Science whose course of study is equivalent to the requirements for admission, may be admitted to the first year, as regular students, on presenting their diplomas, without examination.

Students of Colleges and Schools of Science who shall have completed so much of the course of study as shall be equivalent to the requirements for admission to the School of Mines, may be received without examination, on presenting certificates of good standing and honorable dismissal.

Candidates for advanced standing are examined in all the studies previously pursued by the classes which they propose to enter.

Arrangements can be made at the school for instruction in the preparatory studies.

The regular examinations for admission are held annually on the Wednesday and Thursday preceding the first Monday in October. Candidates will, however, be examined *during the session*, whenever they may present themselves.

Those who are not candidates for a degree may, by special arrangement, pursue any of the branches taught in the school, without previous examination.

COURSE OF INSTRUCTION.

FIRST YEAR.

FIRST SESSION.

MATHEMATICS ; Analytical Geometry of two and three dimensions.
DESCRIPTIVE GEOMETRY ; Straight-line, Plane, and Warped Surfaces.
GRAPHICS ; Elementary Projections and Drawing.
PHYSICS ; Heat and the Steam Engine.
INORGANIC CHEMISTRY ; Non-metallic elements.
QUALITATIVE ANALYSIS ; Behavior of bases and acids with reagents.
MINERALOGY ; Crystallography.
GERMAN LANGUAGE.
FRENCH LANGUAGE.

SECOND SESSION.

MATHEMATICS ; Differential and Integral Calculus.
DESCRIPTIVE GEOMETRY ; Stone-Cutting, and Shades and Shadows.
GRAPHICS ; Projections, Stone-Cutting, and Drawing.
MINING SURVEYING ; Surface and Underground Surveying.
PHYSICS ; Electricity and Magnetism.
INORGANIC CHEMISTRY ; Metals.
QUALITATIVE ANALYSIS ; General Testing.
STOICHIOMETRY ; Problems on Equivalents, Reactions, etc.
MINERALOGY ; Descriptive.
GERMAN LANGUAGE.
FRENCH LANGUAGE.

SECOND YEAR.

FIRST SESSION.

MECHANICS ; Mechanics of Solids, Liquids, and Gases.
MINING ENGINEERING ; Exploitation of Mines.
QUANTITATIVE ANALYSIS ; Analysis of substances of known composition.
METALLURGY ; Furnaces, Fuels, Iron.
MINERALOGY ; Description of Minerals, and Blow-pipe Analysis.
GEOLOGY ; Physiographic Geology, Lithology, and Historical Geology (begun).

SECOND SESSION.

MINING ENGINEERING ; Exploitation of Mines.
QUANTITATIVE ANALYSIS ; Analysis of ores, slags, technical products, etc.
METALLURGY ; Iron and Steel.
MINERALOGY ; Description and Determination of Minerals.
GEOLOGY ; Historical Geology (concluded), and Dynamical Geology.
BOTANY.

THIRD YEAR.

FIRST SESSION.

MINING ENGINEERING ; Machines.
QUANTITATIVE ANALYSIS ; Analysis of ores, slags, technical products, etc.
METALLURGY ; Copper and Lead.
ASSAYING ; Ores of Lead, Silver, and Gold.
CONSERVATION OF FORCE.
GEOLOGY ; Economic.

SECOND SESSION.

MINING ENGINEERING ; Machines.
QUANTITATIVE ANALYSIS ; Analysis of ores, slags, technical products, etc.
METALLURGY ; Lead, Silver, Zinc, Gold, Mercury, Nickel, Cobalt, and Platinum.
ASSAYING ; Ores of Copper, Tin, Antimony, Zinc, Nickel, Mercury, etc., and Bullion.
GEOLOGY ; Theory of Veins.
CONNECTION OF SCIENCES.

TEXT-BOOKS.

Smythe's Analytical Geometry.
Smythe's Differential and Integral Calculus.
Church's Descriptive Geometry.
Peck's Mechanics.
Silliman's Principles of Physics.
Fownes' Manual of Chemistry.
Cooke's Chemical Problems and Reactions.
Tuttle and Chandler's Qualitative Analysis.
Fresenius' Qualitative Analysis.
Fresenius' Quantitative Analysis.
Elderhorst's Blowpipe Analysis.
Egleston's Diagrams for Crystallography.
Dana's Manual of Geology.
Ahn's German Grammar.
Jewett's Ollendorf's French Grammar.

EXERCISES FOR PRACTICE.

DRAWING.

The first and second years are devoted to machine drawing.

During the third year, students are required to draw plans for metallurgical works and mining machinery. These plans are accompanied by a memoir, giving the reasons for their adoption, and the cost, in detail, of their execution. Each pupil will thus make, during his third year, plans applicable to the different cases he may meet with in practice.

SURVEYING.

Surface and underground work.

CHEMISTRY.

Manipulations in the chemical laboratory. During the first year the students are engaged in *qualitative* analysis; the second and third years are devoted to *quantitative* analysis. A detailed report of each quantitative analysis is required to be given in writing by each pupil.

ASSAYING.

The third year is spent by the pupils in the practice of assaying ores and metallurgical products, which they are required to do by the dry and wet way.

METALLURGY.

Examinations of ores and metallurgical products. A method of treatment is required to be given for each ore or *matte* examined; and in case the specimens examined should be the result of any derangement or accident, such as a slag containing too large a percentage of the metal, an opinion, in writing, is required as to the best method of treating it.

MINERALOGY.

Manipulation of crystal models and minerals. During the year mineralogical conferences are held by the professor of mineralogy, at which the students are required to determine minerals, either by their physical or blow-pipe characters. Thorough instruction is given in crystallography and the use of the blow-pipe.

GENERAL INFORMATION.

VACATIONS.

There is a recess in December and one in February, and a vacation during the months of June, July, August, and September.

EXCURSIONS.

During the session, the students visit, with one of the Professors, the different machine-shops and metallurgical establishments of the city and its environs.

During the recesses and vacation each student is expected to visit mining and metallurgical establishments, and to hand in, on his return, a journal of his travels, and a memoir on some subject assigned him. He is also required to bring collections, illustrating his journal and memoir, which collections are placed in the museum, reserved as a medium of exchange, or made use of in the laboratories.

For pupils who have been proficient, and who desire to devote special attention to any one branch, application will be made for permission to work in particular mines or manufactories. This will be done only as the highest reward of merit that the institution can give.

LIBRARY.

A Library and reading-room have been provided for the use of the students of the school.

CABINETS.

Collections of specimens and models illustrating all the subjects taught in the school, are accessible to the students.

Among the recent additions to the facilities afforded to students by the School of Mines, the new laboratories, both for assay and analysis, capable of accommodating one hundred and fifty students, deserve special mention.

Also the collection of specimens representing the useful minerals of our country, iron, coal, gold, silver, copper, lead, petroleum, peat, clays, marbles, &c., &c., and he full course of lectures on economic geology by which they are illustrated

SCHOLARSHIPS.

During the past year a friend of the school guaranteed the sum of two hundred dollars per annum for three years, to meet the expenses of instruction, text-books, etc., in the School of Mines, of one student from the Free Academy, who was selected by examination.

Any person or corporation subscribing the sum of five thousand dollars to the school, will be entitled to have always one student in the school free of charge for tuition.

PRIZES.

Fifty dollars will be given by a friend of the school to the student passing the best examination in mineralogy.

Fifty dollars to the student who passes the best examination in metallurgy.

Fifty dollars to the student who passes the best examination on all the studies of the third year.

CROMWELL PRIZES.

Mr. Charles T. Cromwell has placed in the hands of Trustees the sum of one thousand dollars, the income of which is to be devoted to the purchase of two gold medals, one to be given to the third year student of the regular course who gives evidence of the most thorough knowledge of the theory and practice of quantitative analysis, the other to the regular third year student who is most proficient in draughting.

DEGREES.

The degree of Engineer of Mines, or Bachelor of Philosophy, will be conferred on those students who pass satisfactory examination. Certificates of proficiency will be given to those who pass a satisfactory examination in any one branch. Candidates for the degree of Doctor of Philosophy will be required to pass a special examination.

EXPENSES.

The fee for the full course is two hundred dollars per annum.

Those who wish to devote the whole of their time to chemistry and assaying, are charged two hundred dollars per annum for the use of the Laboratory. These fees are payable, one half on the first day of each session.

Special students in assaying are admitted for two months for a fee of $50.

The fees for single courses of lectures vary from $10 to $30.

A charge of five dollars is made for the diploma.

Apparatus may be purchased of any of the dealers in the city, or it may be borrowed from the supplies of the school. In the latter case the student will be required to make a deposit of twenty dollars. At the end of the session he will be credited with those articles which he returns in good order, while the value of those which he has injured or broken will be deducted from his deposit.

Platinum crucibles, weights, agate mortars, steel mortars, etc., must be paid for on delivery. When they are returned, a deduction will be made from the amount deposited, according to the injury they may have suffered in use.

No charge is made for the ordinary chemicals.

CALENDAR.

1866.	October	1.	First session begins Monday.
	December	22.	Christmas holidays begin Saturday.
1867.	January	4.	Lectures resumed.
	January	25.	First session ends Friday.
	February	15.	Second session begins Friday.
	May	15.	Annual Examinations begin Wednesday.
	May	31.	Second session ends Friday.
	October	3.	Examination for admission, Thursday.
	October	7.	First session begins Monday.

SCHEME OF LECTURES.

FIRST SESSION.

OCT. 1, 1866 . . . JAN. 25, 1867.

FOR FIRST YEAR STUDENTS.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
9 to 10					
10 to 11	Mineralogy, Prof. EGLESTON.	Mineralogy, Prof. EGLESTON.	Qualitative Analysis, Prof. CHANDLER.	Qualitative Analysis, Prof. CHANDLER.	German, Professor JOY.
11 to 12	Physics, Prof. ROOD.		Physics, Professor ROOD.		Physics, Professor ROOD.
12 to 1	German, Prof. JOY.	Inorganic Chemistry, Prof. JOY.	Descriptive Geometry, Professor VINTON.	Inorganic Chemistry, Professor JOY.	Descriptive Geometry, Professor VINTON.
1 to 2		Analytical Geometry, Prof. VAN AMRINGE.	French, Professor VINTON.	Analytical Geometry, Prof. VAN AMRINGE.	French, Professor VINTON.
2 to 3					
3 to 4					
4 to 5					

FOR SECOND YEAR STUDENTS.

9 to 10					
10 to 11	Mineralogy, Prof. EGLESTON.	Mineralogy, Prof. EGLESTON.	Geology, Prof. NEWBERRY.		Geology, Prof. NEWBERRY.
11 to 12		Mechanics, Professor PECK.	Exploitation, Professor VINTON.	Exploitation, Professor VINTON.	Quantitative Analysis, Prof. CHANDLER.
12 to 1	Metallurgy, Prof. EGLESTON.	Metallurgy, Prof. EGLESTON.		Mechanics, Professor PECK.	Mechanics, Professor PECK.
1 to 2	Blowpipe Analysis, Prof. EGLESTON.	Blowpipe Analysis, Prof. EGLESTON.			
2 to 3					
3 to 4					
4 to 5					

FOR THIRD YEAR STUDENTS.

9 to 10					
10 to 11		Conservation of Force, Pres. BARNARD.	Geology, Prof. NEWBERRY.		Geology, Prof. NEWBERRY.
11 to 12			Exploitation, Professor VINTON.	Exploitation, Professor VINTON.	Quantitative Analysis, Prof. CHANDLER.
12 to 1	Metallurgy, Prof. EGLESTON.	Metallurgy, Prof. EGLESTON.	Geology, Prof. NEWBERRY.	Assaying, Prof. CHANDLER.	Geology, Prof. NEWBERRY.
1 to 2					
2 to 3					
3 to 4					
4 to 5					

☞ Hours not occupied by Lectures are devoted to Laboratory Practice under Professor Chandler, assisted by Mr. Julien, Mr. Root, Dr. Schweitzer, and Mr. Day; or to Drawing, under Professor Vinton, assisted by Mr. Casey. Candidates for Degrees will be examined on all the Studies on this Scheme, except French and German.

SCHEME OF LECTURES.

SECOND SESSION.

FEB. 15, 1867. . . . MAY 15, 1867.

FOR FIRST YEAR STUDENTS.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
9 to 10					
10 to 11	Calculus, Prof. VAN AMRINGE.	Shades and Shadows, Prof. VINTON.	Calculus, Prof. VAN AMRINGE.	Stone-Cutting, Prof. VINTON.	Calculus, Prof. VAN AMRINGE.
11 to 12	Physics, Prof. ROOD.	German, Prof. JOY.	Stoichiometry. Prof. CHANDLER.	German, Prof. JOY.	Mining Surveying, Prof. PECK.
12 to 1	Mineralogy, Prof. EGLESTON.	Mineralogy, Prof. EGLESTON.	Inorganic Chemistry, Prof. JOY.	Qualitative Analysis, Prof. CHANDLER.	Inorganic Chemistry, Prof. JOY.
1 to 2			French, Prof. VINTON.	French, Prof. VINTON.	
2 to 3					
3 to 4					
4 to 5					

FOR SECOND YEAR STUDENTS.

9 to 10					
10 to 11	Metallurgy, Prof. EGLESTON.	Metallurgy, Prof. EGLESTON.	Geology, Prof. NEWBERRY.	Quantitative Analysis, Prof. CHANDLER.	Geology, Prof. NEWBERRY.
11 to 12			Exploitation Prof. VINTON.	Exploitation, Prof. VINTON.	
12 to 1	Mineralogy, Prof. EGLESTON.	Mineralogy, Prof. EGLESTON.			
1 to 2					
2 to 3					
3 to 4					
4 to 5					

FOR THIRD YEAR STUDENTS.

9 to 10					
10 to 11	Metallurgy, Prof. EGLESTON.	Metallurgy, Prof. EGLESTON.		Quantitative Analysis, Prof. CHANDLER.	Botany, Dr. TORREY.
11 to 12		Connection of Sciences, Pres. BARNARD.	Exploitation, Prof. VINTON.	Exploitation, Prof. VINTON.	
12 to 1			Geology, Prof. NEWBERRY.		Geology, Prof. NEWBERRY.
1 to 2					
2 to 3					
3 to 4					
4 to 5					

☞ Hours not occupied by Lectures are devoted to Laboratory Practice under Professor Chandler, ssisted by Mr. Julien, Mr. Root, Mr. Schweitzer, and Mr. Day; or to Drawing, under Professor Vinton, assisted y Mr. Casey. Candidates for Degrees will be examined on all the Studies on this Scheme, except French and erman.

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CALENDAR.

1872.	October	7.	First session begins Monday.
	November	28.	Thanksgiving Day, Thursday.
	December	23.	Christmas holidays begin Monday.
1873.	January	6.	Lectures resumed Monday.
	January	24.	First session ends Friday.
	February	13.	Second session begins Thursday.
	May	30.	Second session closes Friday.
	June	2.	Annual examinations begin Monday.
	June	23.	Examination for admission, Monday.
	June	25.	Commencement, Wednesday.
	September	30.	Examination for admission, Tuesday.
	October	6.	First session begins Monday.

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SAMUEL BLATCHFORD, LL.D	12 West 22d Street.
STEPHEN P. NASH	11 West 19th "
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ANTHONY HALSEY	291 "

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LEWIS M. RUTHERFURD	175 Second Avenue.
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FREDERICK A. P. BARNARD, S.T.D., LL.D., L.H.D. Columbia College.
President.

THOMAS EGLESTON, A.M., E.M.................... 10 Fifth Avenue.
Professor of Mineralogy and Metallurgy.

FRANCIS L. VINTON, E.M........................ St. Denis Hotel.
Professor of Civil and Mining Engineering.

CHARLES F. CHANDLER, PH. D.................... 70 East 49th Street.
Professor of Analytical and Applied Chemistry.
Dean of the Faculty.

JOHN TORREY, M.D., LL.D....................... Columbia College.
Lecturer on Botany.

CHARLES A. JOY, PH. D......................... Columbia College.
Professor of General Chemistry.

WILLIAM G. PECK, LL.D......................... 126 East 35th Street.
Professor of Mechanics.

JOHN H. VAN AMRINGE, A.M...................... 140 East 44th Street.
Professor of Mathematics.

OGDEN N. ROOD, A.M............................ 341 East 15th Street.
Professor of Physics.

JOHN S. NEWBERRY, M.D., LL.D.................. Columbia College.
Professor of Geology and Palæontology.

FREDERICK STENGEL.... ....51 East 20th Street.

Instructor in German.

JULES E. LOISEAU.................. ....2 East 33d Street.

Instructor in French.

ALEXIS A. JULIEN, A.M............... ....110 East 80th Street

Assistant in Analytical Chemistry.

ELWYN WALLER, A.M., E.M.......................33 West 15th Street.

Assistant in Analytical Chemistry.

PIERRE DE PEYSTER RICKETTS, .M. ....Elizabeth, N. J.

Assistant in Assaying.

WILLIAM PISTOR, E.M.............................406 West 20th Street.

Assistant in Drawing.

HENRY NEWTON, A.B., E.M........ ....26 West 21st Street.

Assistant in Geology.

HENRY BEDINGER CORNWALL, A.M., E.M ....1267 Broadway.

Assistant in Mineralogy.

HENRY CARRINGTON BOLTON, A.M., PH. D........49 West 51st Street.

Assistant in Analytical Chemistry.

EDWARD JOHN HALLOCK, A.M...................110 East 54th Street.

Assistant in General Chemistry.

JOHN F. MEYER........ ....41 Horatio Street.

Registrar and Librarian.

GRADUATES.

1867.

JOHN MAGNUS ADAMS, A.M., E.M. ....Ruby City, Idaho.
Metallurgist to the Owyhee Silver Mining Co.

SAMUEL WILLARD BRIDGHAM, E.M. (1868) ....49 West 23d Street.

FRANCIS GORDON BROWN, E.M. (1868)................Tarrytown.

EDWARD STELLE BROWNSON, A.M., E.M.(1869)...Brooklyn.
Consulting Engineer.

JOHN ADAMS CHURCH, E.M. (1868).................39 Park Row.
Consulting Engineer.

HENRY BEDINGER CORNWALL, A.M., E.M. (1869)..1267 Broadway.
Assistant in Mineralogy, School of Mines.

EDWARD EVERETT GIDDINGS, E.M. (1872)...21 S. Canal St., Chicago, Ill.
Mining Engineer.

CHARLES KING GRACIE, A.B., E.M. (1868).........Elizabeth, N. J.

ALBERT WARD HALE, A.M., E.M. (1872)...........57 Broadway.
Mining and Civil Engineer.

THOMAS HAYES HARMER, A.M., E.M. (1872).........113 East 37th Street.

DAVID VAN LENNEP, E.M. (1868)........................Unionville, Nevada.

Superintendent of Silver Mines.

FREDERIC MILTON PETIT, E.M. (1872)..............Pompton, N. J.

Mining Engineer.

WILLIAM WEY TUTTLE, E.M. (1868)...............118 Fifth Avenue.

Chemist and Mining Engineer.

1868.

WILLIAM HENRY VAN ARSDALE, A.M., E.M......Inoiyo County, Cal.

Owen's Lake Smelting Works.

TUS PORTER BARNARD, E.M. (1870)........Washington, D. C.

U. S. Coast Survey.

GEORGE STRONG BAXTER, A.B., E.M...............50 Wall Street.

Mining Engineer.

JAMES PETTIGREW CARSON, E.M............128 Broadway, Room 13.

Mining Engineer.

ALBERT HUNTINGTON CHESTER, E.M............Clinton, N. Y.

Childs Professor of Agricultural Chemistry, Hamilton College.

GEORGE HAMPTON COURSEN, E.M...............145 Chambers Street.

Resident Engineer, Squam R. R., Farmingdale, Monmouth Co., N. J.

GEORGE JARVIS GEER, Jr., E.M...................238 West 55th Street.

GEORGE BYRON HANNA, A.B., E.M...............Raleigh, N. C.

Chemist, Geological Survey of North Carolina.

ARCHIBALD MACMARTIN, A.M., E.M...............168 Fifth Avenue.

Chemist, Wilson Steel Works, Providence, R. I.

EDWARD STEWART MOFFAT, A.B., E.M..........Easton, Pa.

Lecturer on Mining, Lafayette College, and Mining Engineer.

Manager Port Oram Iron Works, N. J.

GEORGE HOWLAND PARSONS, E.M. (1869) ....Flushing, L. I.

WILLIAM PISTOR, E.M. (1869)..............................406 West 20th Street.
Assistant in Drawing, School of Mines.

CHARLES SLASON PLATT, E.M..........................4 Liberty Place.
Gold and Silver Refinery.

KENNETH ROBERTSON, E.M..............................Pittsburg, Pa.
Mining Engineer.

ALBERT P. SCHACK, E.M. (1869)........ ....Madison Ave., N. Y.

FREDERICK AUGUSTUS SCHERMERHORN, E.M. (1870).
In Europe.

LENOX SMITH, A.B., E.M...................................453 West 21st Street.

WILLIAM ALLEN SMITH, E.M.........................108 East 25th Street.

FREDERIC STALLKNECHT, E.M. (1869).... .... 946 Second Avenue.

MOSES DILLON WHEELER, A.B., E.M ....Carson City.
Melter and Refiner, U. S. Branch Mint, Carson City, Nevada.

1869.

THOMAS MONAHAN BLOSSOM, A.M., E.M.........334 East 124th Street.

FREDERICK BRUCKMAN, E.M...........................824 Lexington Ave.
Chemist, Rosevelt & Sons' Mirror Works, 94 Maiden Lane, N. Y.

ALONZO CLARENCE CAMPBELL, E.M........400 Chestnut Street, Phila.

WILLIAM AUGUSTUS HOOKER, A.M., E.M. ....Cleveland, O.
Chemist, Cleveland Iron Works

ROLAND DUER IRVING, E.M ....Madison, Wis.

Professor of Geology, Mining and Metallurgy in the University of Wisconsin.

WALTER PROCTOR JENNEY, E.M. (1871)..........Fairhaven, Mass.

HENRY MAYNARD MONROE, E.M. (formerly Smith).. 195 Harrison St., Brooklyn.

Mining Engineer in the Service of the Government of Japan.

LIONEL ROBERT NETTRE, E.M ....Brooklyn.

In Europe.

HENRY NEWTON, A.B., E.M ....26 West 21st Street.

Assistant in Geology, School of Mines.

WILLIAM BLEECKER POTTER, A.M., E.M ....St. Louis, Mo.

Professor of Mining and Metallurgy, Washington University.

JOHN COOPER RANDOLPH, A.M., E.M..........87 Washington St., J. C.

In the Service of the Japanese Government.

1870.

OGDEN HAIGHT, E.M........ ....Blairsville, Pa.

Isabella Furnace Co., Blairsville, Indiana Co., Pa.

JOHN AUGUSTUS KNAPP, A.M., E.M.... .. ..58 Irving Place.

Assistant Engineer, Central Park, N. Y.

JOHN LEO LILIENTHAL, E.M. (1871).... ....230 West 25th Street.

San Francisco, Cal.

STUART LINDSLEY, E.M..........................Orange, N. J.

Engineer, Care of N. & G. Lindsley.

EDWARD MOORE PARROT, E.M. (1871)... ....Salt Lake City.

Miller Mining and Smelting Company.

RICHARD HENRY TERHUNE, E.M.... ....Hackensack, N. J.

THEODORE FRANCIS VAN WAGENEN, E.M........Denver, Col. T.

Mining Engineer and Editor of the "Western Miner and Engineer."

ELWYN WALLER, A.M., E.M.........................33 West 15th Street.

Assistant in Analytical Chemistry, School of Mines.

1871.

S. ANTHONY GOLDSCHMIDT, A.M., E.M......142 West 21st Street, N. Y

Assistant Inspector of Fertilizers, Savannah, Ga.

JOHN GORDON, Jr., E.M ....313 East 58th Street

PIERRE DE PEYSTER RICKETTS, E.M ....Elizabeth, N. J.

Assistant in Assaying, School of Mines, Columbia College.

GEORGE WASHINGTON RIGGS, Ph. B...............Baltimore, Md.

In Europe.

GRACIE SAYRE ROBERTS, E.M ....88 Union Ave., Brooklyn, E. D.

Assistant in Civil Engineering, School of Mines, Columbia College.

RICHARD SPOTSWOOD ROBERTSON, Jr., E.M......Pittsburg, Pa.

Mining Engineer and Chemist.

1872.

FRANK B. JENNEY, E.M ....Marquette, Mich.

Chemist and Mining Engineer.

FREDERICK H. McDOWELL, E.M...............121 Front Street, N. Y.

Mining Engineer.

THOMAS O'CONOR SLOANE, A.B., E.M ....55 Pine Street.

Assistant to Prof. C. F. Chandler.

ARTHUR F. WENDT, E.M.............................92 Broadway.

Mining Engineer.

STUDENTS.

THIRD YEAR STUDENTS.

NAMES.	RESIDENCES.	ADDRESS.
Frederick A. Canfield, A. B., (R.)	Dover, N. J.	Dover, N. J.
Charles Adams Colton	New York City	748 Fifth Street.
Henry Augustus Mott, Jr	New York City	99 Park Avenue.
Henry Walter Webb	New York City	310 Madison Avenue.
John Townsend Williams	New York City	50 West 50th Street.

SECOND YEAR STUDENTS.

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John Gedney Mott Cameron	New York City	87 Seventh Avenue.
Edward Bond Foote	New York City	120 Lexington Avenue.
William Latimer	Wilmington, N. C	487 West 22d Street.
Robert Lawrence	Flushing, L. I	67 William Street.
Albert Reid Ledoux	Cornwall on Hudson, N. Y.	117 East 54th Street.
S. Morris Lillie	Elizabeth, N. J	Elizabeth, N. J.
Arthur Macy	New York City	159 Henry Street.
George Murray	New York City	297 Seventh Avenue.
Eben Erskine Olcott	New York City	111 West 13th Street.
Benjamin Franklyn Rees	New York City	303 East 17th Street.
Francis Bell Forsyth Rhodes	Quebec, Canada	41 West 36th Street.
Leopold Tanco	Bogota, Colombia	27 West 38th Street.
Frederick Harrison Williams	Orange, N. J.	

FIRST YEAR STUDENTS.

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Thomas Douglas Hoxsey, Jr.	Paterson, N. J.	135 West 48th Street.
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Malvern W. Iles	Davenport, Iowa	21 McDougal Street.
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Charles King	New York City.	39 West 14th Street.
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Julius Martinez	Cuba.	365 Lexington Avenue.
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Lascelles Herman Maxwell	Mott Haven, Westchester Co., N. Y.	
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William Noyes	Brooklyn, N. Y.	104 Columbia Heights.
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F. S. Perrin	Jamaica, Queens Co., N.Y.	
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Franklyn Pool	Newark, N. J.	159 William Street.
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Bayard T. Putnam	New York City.	328 East 15th Street.
Charles M. Rolker	Brooklyn	212 Wyckoff Street.
William Rupp	New York City.	13 Avenue A.
Israel Russell	Jersey City, N. J.	
Samuel Howland Russell	New York City.	417 Fifth Avenue.
David E. Simon	New York City.	20 West 56th Street.
Hunter Stewart	New Orleans, La.	153 East 51st Street.
Edward George Stoiber	New York City.	132 Essex Street.
Elbert C. Van Blarcom	Summit, N. J.	135 West 48th Street.
Leonard Waldo, B.S., (Ma.)	Cincinnati, O.	223 East 39th Street.
Martin E. Waldstein	New York City.	40 East 35th Street.
James S. Chester Wells	Hackensack, N. J.	Lockwood & Co., 94 B'dway, N.Y.
E. A. Wetmore	Marquette, Mich.	153 East 51st Street, N. Y.

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Thomas Ellis Brown	New York City	337 West 34th Street.
Gustav Bunzl	New York City	563 Madison Avenue.
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George Birdsall Cornell	New York City	46 West 48th Street.
George Rockwell Cornwall	Brooklyn, N. Y	17 Park Place.
Francis Sanderson Craven	Newark, N. J	30 Walnut Street.
Lawrence Effingham Embree	Flushing, N. Y.	
Frederic William Floyd	New York City	14 Van Nest Place.
Herbert Carrington Foote	Cleveland, O	155 Mercer Street.
Edmund Hyatt Garrison	Yonkers, Westchester Co., N. Y.	
George Andrew Henderson	Brooklyn, N. Y	Naval Laboratory, New York.
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Frederick Furneaux Hunt	Quebec, Canada	41 West 36th Street.
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Edward Augustus Jackson	New York City	35 East 20th Street.
John L. Leib	New York City	108 East 38th Street.
C. L. Lindsey	New York City.	
Theodore Melius	Newark, N. J.	
H. F. Morewood	Fort Washington, N. Y.	56 Wall Street.
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Ralph Nichols	Nyack, N. Y.	Nyack, Rockland Co., N. Y.
Stoyell Cady Parsons	New York City	206 West 38th Street.
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Robert Dunn Rhodes	Quebec, Canada	41 West 36th Street.
Vincent S. Seltzer	New York City	51 West 56th Street.
William W. Shotwell	New York City	114 East 37th Street.
George Cyrus Tilden	Brooklyn, N. Y.	22 Douglass Street, Brooklyn.
Milton Strong Thompson	Islip, L. I., N. Y	564 Madison Avenue, N. Y.
R. W. Van Boskerck	Hackensack, N. J	2 Exchange Court, N. Y.
Victor Warren Voorhees	Newark, N. J	144 Macdougal Street.
James Robert Wardlaw	New Brighton, N. Y.	34 White Street.
William Twining Wells	Hackensack, N. J.	Care Lockwood & Co., 94 Broadway, N. Y.
Calvin Mather Wetmore	New York City	119 Lexington Avenue.
John Bellinger White	New York City	222 Second avenue.

NAMES.	RESIDENCES.	ADDRESS.
A. C. Walbridge	Brooklyn	71 Downing Street, Brooklyn.
Leighton Williams	New York City	27 Grove Street.
C. B. Wilson	Ridgefield, N. J	218 Washington Street, N. Y.
Raphael R. Zingsem	Hackensack, N. J.	

SPECIAL STUDENTS.

Joseph Goodnow Allyn, A.B. (McK.)	Lebanon, Ill	202 South 9th Street, W'msb'g.
Peter Townsend Austen	Edgewater, N. Y	Box 130, Stapleton, S. I.
Thomas E. R. Barron	Jersey City Heights, N. J	Box 145, Jersey City, N. J.
Walter Hale Camp	Watertown, N. Y	44 West 9th Street.
Loverd Bryan Cheatham	Dawson, Ga	13 West Washington Place.
Wm. D. Crumbie	Orange, N. J.	
Newbold R. Edgar	New York City	173 Lexington Avenue.
Wm. Edward Sanford Fales	Brooklyn	18 Platt Street.
Clarence Wilmot Grant	Yonkers, N. Y	Box 148, Yonkers, N. Y.
G. De Forrest Grant	New York City	11 Grammercy Park.
John B. Hassloeher, Jr	New York City	92d Street, 2d and 3d Avenues.
Frank G. Haughwout	New York City	111 West 34th Street.
William Frederic Henes	Milwaukee, Wis	215 East 35th Street.
Henry E. Jones	New York City	14 West 23d Street.
S. W. Kearney	New York City	18 East 28th Street.
Wm. T. Lees	Brooklyn	67 Pineapple Street.
Frederic Lowey	New York City	340 East 19th Street.
Francis Lynch	Newburgh	128 Broadway, New York.
. Master, Jr	Flushing, L. I.	121 East 54th Street.
Augustin Monroe	New York City	37 East 10th Street.
Augustus Coe Pirsson, A.B., (C.,	New York City	11 Wall Street.
George Jewett Rockwell, A. B., (N.Y.U)	Hoboken, N. J	Care H. B. Claflin & Co., N. Y.
F. W. Rohrbeck	Berlin	127 Garden Street, Brooklyn.
James G. Sands	New York City	53 Lexington Avenue.
Earnest Albert Schreck	Hoboken, N. J	325 Garden Street.
Charles A. Sniffen	New York City	5 East 42d Street.
Frederic William Staebner	New York City	86 Seventh Street.
John Ruggles Strong, A. B., (C.)	New York City	113 East 21st Street.
Alfred O. Tapping	Utica, Oneida Co, N. Y	273 Degraw Street, B'klyn.
W. H. S. Thorburn	Morristown, N. J.	15 John Street.
Alfred Torrance	New York City	379 Fifth Avenue.
Milton Turnure	Closter, N. J	Closter, Bergen Co., N. J.
Albert Williams, Jr	San Francisco, Cal	15 East Washington Place.
Abram Frederic Underhill	New York City	232 East 18th Street.
Andrew C. Zabriskie	New York City	12 East 30th Street.

ABBREVIATIONS.

A	Alleghany College, Pa.
Ag. C	Agricultural College, Pa.
C	Columbia College, N. Y.
D. C	Dickinson College, Pa.
Harv	Harvard College, Mass.
Ham	Hamilton College, N. Y.
L	Lafayette College, Pa.
M.	Miami University, Ohio.
McK	McKendree College, Ill.
Ma	Mariettta College, Ohio.
N. Y	College of the City of New York.
N. Y. U	New York University.
P	Princeton College, N. J.
R	Rutgers College, N. J.
St. F. X	St. Francis Xavier's College, N. Y.
St. J	St. John's College, N. Y.
T.	Trinity College, Conn.
W	Williams College, Conn.

SUMMARY.

Third year Students	5
Second " "	15
First " "	39
Preparatory Students	42
Special Students	35
Total	136

PRIZE STUDENTS.

TORREY PRIZES.

Fifty Dollar Prize.

For the Best Written and Experimental Examination in Qualitative Analysis.

FREDERICK HARRISON WILLIAMS.

HONORABLY MENTIONED.

EDWARD BOND FOOTE.
ARTHUR MACY.
EBEN ERSKINE OLCOTT.

Fifty Dollar Prize.

For the Most Thorough Knowledge of the Theory and Practice of Assaying.

FRANK B. JENNEY.

HONORABLY MENTIONED.

FREDERICK H. MCDOWELL.
ARTHUR F. WENDT.

REQUIREMENTS FOR ADMISSION.

THE PREPARATORY YEAR.

Candidates for the preparatory year must be seventeen years of age, and must pass a satisfactory examination in arithmetic, including the metric system of weights, measures, and moneys; in algebra, the first five chapters of Davies' University Algebra; and in geometry, on the first five books of Davies' Legendre.

THE FIRST YEAR.

Candidates for admission to the first year of the school must not be less than eighteen years of age.

They must pass a satisfactory examination in algebra, geometry, and plane, analytical, and spherical trigonometry, physics, and general chemistry.

Graduates and students of colleges and schools of science who shall have completed so much of the course of study as shall be equivalent to the requirements for admission to the School of Mines, may be admitted to the first year without examination, on presenting their diplomas or certificates of good standing and honorable dismissal.

Candidates for advanced standing are examined in all the studies previously pursued by the classes which they propose to enter.

The regular examinations for admission are held annually on the Monday before Commencement (June 23, 1873), and on the Tuesday preceding the first Monday in October (September 30, 1873). Candidates will, however, be examined during the session, whenever they may present themselves.

SPECIAL COURSES OF STUDY.

Students may be admitted to special courses of study or practice in Chemistry, Assaying, Geology, or Natural History, if it shall appear to the professors in those departments that they are qualified to pursue such studies with profit.

Applicants for admission to special courses in other departments, shall not be received into the School except by vote of the Faculty, nor without good reason shown why they should not take a regular course. Every such applicant, before being so admitted, must pass such examinations as are required of regular students for admission to the course proposed.

EXPENSES

The fee for the full course is two hundred dollars per annum.

Special students in Chemistry pay two hundred dollars per annum.

These fees are payable, one half on the first day of each session.

Special students in assaying are admitted for two months for a fee of fifty dollars in advance.

The fees for single courses of lectures vary from ten dollars to thirty dollars.

A charge of five dollars is made for the diploma.

Apparatus may be purchased of any of the dealers in the city, or it may be borrowed from the supplies of the school. In the latter case the student will be required to make a deposit of twenty dollars. At the end of the session he will be credited with those articles which he returns in good order, while the value of those which he has injured or broken will be deducted from his deposit.

Platinum crucibles, weights, agate mortars, steel mortars, etc., must be paid for on delivery. When they are returned, a deduction will be made from the amount deposited, according to the injury they may have suffered in use.

No charge is made for the ordinary chemicals.

FREE STUDENTS.

Whenever it appears to the satisfaction of the President and Treasurer of the College, that a student, who is of good moral character and industrious habits, desires to pursue the studies of the School of Mines, but is unable to pay the usual fees for tuition, he may be admitted without charge; or, in case he shall so elect, may give his note for the amount, payable at his convenience, after he leaves the School. This relieves the student from the payment of the fee of two hundred dollars per annum for tuition.

GENERAL STATEMENT.

The School of Mines was established in 1864 for the purpose of furnishing to students the means of acquiring a thorough knowledge of those branches of science which form the basis of the industrial pursuits that are to play the most important part in the development of the resources of our country.

The system of instruction includes five parallel courses of study, viz.:

I. CIVIL ENGINEERING.
II. MINING ENGINEERING.
III. METALLURGY.
IV. GEOLOGY AND NATURAL HISTORY.
V. ANALYTICAL AND APPLIED CHEMISTRY.

The plan of instruction includes lectures and recitations in the several departments of study; practice in the chemical, mineralogical, blow-pipe, and metallurgical laboratories; projects. estimates, and drawings for the establishment of mines, and for the construction of metallurgical and chemical works, reports on mines, industrial establishments, and field geology.

Instruction is given in the following subjects:

ANALYTICAL GEOMETRY,
CALCULUS,
DESCRIPTIVE GEOMETRY,
MECHANICS,
CIVIL ENGINEERING,
MINING ENGINEERING,
MINE MACHINERY,
MINE SURVEYING,
PHYSICS,
INORGANIC CHEMISTRY,
ORGANIC CHEMISTRY,
STOICHIOMETRY,
ANALYTICAL CHEMISTRY,
APPLIED CHEMISTRY,
METALLURGY,
ASSAYING,
BLOWPIPE ANALYSIS,
CRYSTALLOGRAPHY,
MINERALOGY,
GEOLOGY,
PALÆONTOLOGY,
BOTANY,
ZOOLOGY,
SHADES, SHADOWS, AND PERSPECTIVE,
STONE CUTTING,
MACHINE, MAP, AND TOPOGRAPHICAL DRAWING,
SKETCHING, IN PENCIL AND COLORS,
FRENCH,
GERMAN.

The course of instruction occupies three years. Those who complete it receive the degree of Engineers of Mines, Civil Engineer, or Bachelor of Philosophy.

For candidates not qualified to enter the first year, there is a preparatory year.

The year is divided into two sessions. The first commences on the first Monday in October; the second on the 13th of February. The lectures close on the 30th of May, and are followed by an examination on the studies of the year.

The method of instruction is such that every pupil may acquire a thorough theoretical knowledge of each branch, of which he is required to give evidence at the close of the session, by written and oral examinations. At the commencement of the following year he is required to show, from reports of works visited, that he understands not only the theoretical principles of the subjects treated, but also their practical application, a point that is insisted on with great rigor.

SYNOPSIS OF STUDIES.

I.—COURSE OF CIVIL ENGINEERING.

FIRST YEAR.

Analytical Geometry and Calculus.
Descriptive Geometry—Lectures and exercises.
Shades, Shadows and Perspective; Lectures and exercises.
Stone Cutting.
Stoichiometry—Lectures and blackboard exercises.
Qualitative Analysis—Lectures and laboratory practice.
Crystallography—Lectures and practical exercises.
Blowpipe Analysis, qualitative—Lectures and laboratory practice.
Botany—recent and fossil.
Zoology—recent and fossil.
French.
German.
Drawing—mechanical, right line pen, shading in India Ink; Topographical and Hydrographical drawing, with pen and with color.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

SECOND YEAR.

Mechanics—Mechanics of solids; Mechanics of liquids; Mechanics of gases.
Civil engineering.
Spherical projections.
Geodesy—Surveying with chain, with compass, with angular instruments, and with plane table; Practical Trigonometry, Levelling, Hydrography, Geodesic operations for the construction of maps.
Quantitative analysis—Lectures and laboratory practice.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic and dynamic.
Mineralogy—Determinative mineralogy, and Blowpipe examination of minerals.
Physics—Undulatory theory of Light, Ohm's law, etc.
German.
Drawing—Machines and Constructions.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

THIRD YEAR.

Mechanics applied to engineering; resistance of materials.
Constructions—Hydraulics, pneumatics, machines, turbines and other water-wheels, air and steam engines, etc.
Economic Geology—Theory of mineral veins; ores; deposits and distribution of metals; iron, copper, lead, etc.; character, history, uses, and distribution of coal, lignite, peat, petroleum, salt, clays, building and ornamental stones, fertilizers, etc.
Drawing.
Project—Dissertation and drawings, embracing the solution of some problem in engineering, assigned by the Faculty of the School.

DEGREE OF CIVIL ENGINEER.

II.—COURSE IN MINING ENGINEERING.

FIRST YEAR.

Analytical Geometry and Calculus.
Descriptive Geometry—Lectures and exercises.
Shades, Shadows, and Perspective—Lectures and exercises.
Stone cutting.
Stoichiometry—Lectures and blackboard exercises.
Qualitative Analysis—Lectures and laboratory practice.
Crystallography—Lectures and practical exercises.
Blowpipe Analysis, qualitative—Lectures and Laboratory practice.
Botany—recent and fossil.
Zoology—recent and fossil.
French.
German.
Drawing—Use of instruments; problems in descriptive geometry, shades, shadows, perspective, and stone cutting.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

SECOND YEAR.

Mechanics—Mechanics of solids—mechanics of liquids—mechanics of gases.
Mining Engineering—Surveying and Mining Operations.
Quantitative analysis—Lectures and laboratory practice.
Blowpipe analysis, quantitative—Lectures and laboratory practice.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic, and dynamic.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
Physics—undulatory theory of light, Ohm's law, etc.
German.
Drawing—Machines, plans, etc.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

THIRD YEAR.

Mining Engineering—Mining Machines.

Assaying—Lectures and laboratory practice; ores of lead, silver, gold, tin, antimony, copper, nickel, cobalt, and mercury; gold and silver bullion.

Economic Geology—Theory of mineral veins; ores; deposits and distribution of metals; iron, copper, lead, etc.; character, history, uses, and distribution of coal, lignite, peat, petroleum, salt, clays, building and ornamental stones, fertilizers, etc.

Metallurgy—Lectures on copper, lead, silver, gold, zinc, etc.

Quantitative Analysis—Laboratory practice.

Drawing—Machines, plans, etc.

Projects—Dissertation and drawings, embracing the solution of some mechanical, mining, or metallurgical problem, assigned by the Faculty of the School.

DEGREE OF MINING ENGINEER.

III.—COURSE IN METALLURGY.

FIRST YEAR.

Analytical Geometry and Calculus.
Descriptive Geometry—Lectures and exercises.
Shades, Shadows, and Perspective—Lectures and exercises.
Stone cutting.
Stoichiometry—Lectures and blackboard exercises.
Qualitative Analysis—Lectures and laboratory practice.
Crystallography—Lectures and practical exercises.
Blowpipe Analysis, qualitative—Lectures and laboratory practice.
Botany—recent and fossil.
Zoology—recent and fossil.
French.
German.
Drawing—use of instruments; problems in descriptive geometry, shades, shadows, perspective, and stone cutting.

SUMMER VACATION:

MEMOIR AND JOURNAL OF TRAVEL.

SECOND YEAR.

Mechanics.
Quantitative Analysis—Lectures and laboratory practice.
Blowpipe Analysis, quantitative—Lectures and laboratory practice.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic, and dynamic.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
German.
Drawing—Furnaces, machines, etc.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

THIRD YEAR.

Assaying—Lectures and laboratory practice; ores of lead, silver, gold, tin, antimony, copper, nickel, cobalt, and mercury; and gold and silver bullion.

Economic geology—Theory of mineral veins; ores; deposits and distribution of metals; iron, copper, lead, etc.; character, history, uses, and distribution of coal, lignite, peat, petroleum, salt, clays, building and ornamental stones, fertilizers, etc.

Metallurgy—Lectures on copper, lead, silver, gold, zinc, etc.

Quantitative Analysis—Laboratory practice.

Lithology—The character and genesis of rock masses; microscopic and chemical study of rocks.

Drawing—Furnaces, machines, etc.

Project—Dissertation and drawings, embracing the solution of a metallurgical problem, assigned by the Faculty of the School.

DEGREE OF BACHELOR OF PHILOSOPHY.

IV.—COURSE IN GEOLOGY AND NATURAL HISTORY.

FIRST YEAR.

Descriptive Geometry—Lectures and exercises.
Shades, Shadows, and Perspective—Lectures and exercises.
Chemistry, inorganic and organic—Lectures and recitations.
Stoichiometry—Lectures and blackboard exercises.
Qualitative Analysis—Lectures and laboratory practice.
Crystallography—Lectures and practical exercises.
Blowpipe Analysis, qualitative—Lectures and laboratory practice.
Botany—recent and fossil.
Zoology—recent and fossil.
French.
German.
Drawing—Use of instruments; problems in descriptive geometry, shades, shadows, and perspective.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

SECOND YEAR.

Quantitative Analysis—Lectures and laboratory practice.
Blowpipe Analysis, quantitative—Lectures and laboratory practice.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic, and dynamic.
German.
Drawing.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

THIRD YEAR.

Economic Geology—Theory of mineral veins; ores; deposits and distribution metals; iron, copper, lead, etc.; character, history, uses, and distribution of coal, lignite, peat, petroleum, salt, clays, building and ornamental stones, fertilizers, etc.

Lithology—The character and genesis of rock masses; microscopic and chemical study of rocks.

Palæontology—Systematic review of recent and fossil forms of life, animal and vegetable.

Metallurgy.

Drawing.

Dissertation, embracing results of observation and study of some subject assigned by the Faculty of the School.

DEGREE OF BACHELOR OF PHILOSOPHY.

V.—COURSE IN ANALYTICAL AND APPLIED CHEMISTRY.

Descriptive Geometry—Lectures and exercises.
Shades, Shadows, and Perspective—Lectures and exercises.
Chemistry, inorganic and organic—Lectures and recitations.
Stoichiometry—Lectures and blackboard exercises.
Qualitative Analysis—Lectures and laboratory practice.
Crystallography—Lectures and practical exercises.
Blowpipe Analysis, qualitative—Lectures and laboratory practice.
Botany, recent and fossil.
Zoology, recent and fossil.
French.
German.
Drawing—Use of instruments; problems in descriptive geometry, shades, shadows, and perspective.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

SECOND YEAR.

Applied Chemistry—Lectures on chemical manufactures; acids, alkalies, and salts; glass, porcelain, pottery, limes, mortars and cements.
Quantitative Analysis—Lectures and laboratory practice.
Blowpipe analysis, quantitative—Lectures and laboratory practice.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic, and dynamic.
German.
Drawing—Furnaces, machines, apparatus, etc.

SUMMER VACATION.

MEMOIR AND JOURNAL OF TRAVEL.

THIRD YEAR.

Applied Chemistry—(1) Fuel and its applications; (2) Artificial Illumination; candles, oils, and lamps, petroleum, gas and its products; (3) Food and Drink: water, milk, cereals, starch, bread, meats, tea, coffee, sugar, fermentation, wine, beer, spirits, vinegar, preservation of food, tobacco, etc.; (4) Clothing: textile fabrics, bleaching, dyeing, calico printing, paper, tannin, glue, india-rubber, gutta-percha, etc.; (5) Artificial fertilizers: guano, superphosphates, poudrettes, etc.; (6) Disinfectants, Antiseptics, Preservation of Wood, etc.

Quantitative Analysis—Laboratory Practice.

Assaying—Lectures and Laboratory Practice: ores of lead, silver, gold, tin, antimony, copper, nickel, cobalt, mercury, and gold and silver bullion.

Economic Geology—Theory of mineral veins; deposits of metallic ores; iron, copper, etc.; coal, peat, lignite, petroleum, salt, clay, building and ornamental stones, fertilizers, etc.

Metallurgy—Lectures on copper, lead, silver, gold, zinc, mercury, etc.

Drawing—Furnaces, machines, apparatus, etc.

Dissertation, embracing results of observations and experimental study on some chemical subject assigned by the Faculty of the School.

DEGREE OF BACHELOR OF PHILOSOPHY.

PREPARATORY YEAR.

Geometry, Algebra, Trigonometry, and Mensuration.

Physics.

Chemistry, Inorganic and Organic—Lectures and recitations.

French.

German.

Drawing—Map drawing, topography, sketching from plane models and from nature, water-color landscapes.

DEPARTMENTS OF INSTRUCTION.

MATHEMATICS.

PREPARATORY YEAR.

ALGEBRA—so far as to include the general theory of equations.
GEOMETRY—Plane, Volumetric, and Spherical.
TRIGONOMETRY—Plane, Analytical, and Spherical.
MENSURATION of Surfaces and of Volumes.

FIRST YEAR.

ANALYTICAL GEOMETRY of two and three dimensions.
DIFFERENTIAL AND INTEGRAL CALCULUS.

PHYSICS.

The students in the Preparatory Year are occupied during the first term with the subject of Heat, including the Steam-Engine, while the second term is employed in the study of Voltaic Electricity, Magnetism, and Electro-magnetism. These courses of lectures are fully illustrated by appropriate experiments; the instruction is conveyed by lectures and recitations, practical problems being occasionally proposed for solution.

During the second year, courses of lectures are delivered on the laws of Electro-dynamics, on the Mechanical Theory of Heat, on Mathematical Optics, and on the Undulatory Theory of Light. Portions of these courses are accompanied by experimental demonstrations.

The cabinet of Physical Apparatus will rank with the best on this continent, and extensive additions are made to it each year.

MECHANICS.

This subject is taught during the second year. The course of instruction embraces the following subjects:

Representation and measurement of forces; composition, resolutions, and equilibrium of forces; principles of moments and virtual moments; theory of parallel forces; application to centre of gravity; stability.

Elementary machines; friction, resistance to rolling, stiffness of cords, atmospheric resistance.

General equations of motion; rectilineal, uniform and uniformly varied motion; curvilinear motion, free and constrained; centrifugal force; application to the governor; vibratory motion; application to the pendulum; motions of translation and rotation; moment of inertia, principal axes and ellipsoid of inertia; laws of impact; centre of percussion; general theorem of work; accumulation of work; application to fly-wheel.

Mechanics of fluids; pressure due to weight; equal transmission of pressures; application to hydraulic press; buoyancy and flotation; application to specific gravity.

Tension and elasticity of gases and vapors; laws of variation; application to pumps and siphons; investigation of the barometer formula; motion of liquids in pipes and open channels; living force of fluids; application to hydraulic ram; mechanics of capillarity.

DRAWING AND DESCRIPTIVE GEOMETRY.

During the first session of the Preparatory Year the student is taught to execute topographical maps. He is first instructed in the use of the pen to delineate lines of level, shaded with lines of declivity, and completed with the conventional signs of different features, such as water, forests, marshes, cultivated grounds, out-crops of veins, etc.; subsequently he is taught to represent the same in shading of India-ink or sepia, with the application of the conventional signs and colors used by our Government and Civil Engineers. During the second session the course of instruction includes sketching in pencil from plane models, and from nature; afterwards colored sketches or landscape drawing in water colors.

During the first year Descriptive Geometry is taught. The course of instruction includes the study of Davies' treatise on this subject, with lectures and blackboard exercises, illustrated by Olivier's and other models, exposing the more difficult problems of intersections and the generation of warped surfaces.

The instruction in drawing includes the use of mathematical instruments in constructing on paper the problems of Descriptive Geometry.

During the second session Graphics are taught, including the study of Davies' Shades and Shadows and Perspective, and Mahan's Stone-Cutting, with explanatory lectures, the exhibition of models, and the solution of various problems of shades and shadows, specially those cast on the sections of machines, furnaces, etc.

The course of drawing includes instruction and practice in the use of instruments, the pen and brush, with India-ink, in drawing mathematical forms in projection and perspective, shading them, casting their shadows, and washing them. This is followed by an application of the principles learned to the execution of a drawing of a machine, or the section of a furnace, wherein the shadows are accurately calculated and washed, and the drawing is appropriately colored.

In the second year the course includes during the first session the drawing of machines, mills, furnaces, etc., from plane models. These are shaded, their shadows calculated, and cast, and the whole properly colored. The dimensions are also quoted, so that these drawings serve as types of working drawings.

During the second session the students draw from various models in relief, chiefly furnaces and machines. They first make a free hand sketch from the relief, and upon it place the dimensions which they measure; subsequently they draw the finished representation in the academy, to a proper scale with shades, shadows, colors, and dimensions. This practice is of benefit in accustoming the student to take rapid sketches of established works upon which he may be required to report, or by which he may wish to direct himself.

CIVIL ENGINEERING

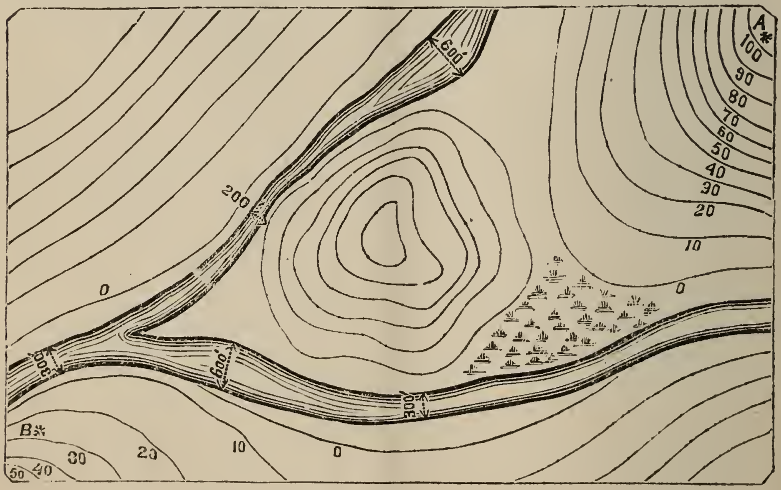
is taught during the second and third years. In the second year the course of instruction will include Surveying, Topography, Geodesic operations for the tracing of maps, Hydrography, etc., to be followed by a course of construction in general engineering statics, and a course of roads and bridges, etc., according to Mahan's Civil Engineering, which will be used as a text-book, with Wood's Resistance of Materials.

The Drawing will include maps, problems in stone-cutting, and copies from models, plane and in relief.

During the vacation at the close of the second year, students will be required to prepare a Memoir on Draw and Turning Bridges, and Cables for Suspension Bridges, to be handed in on or before November 1st.

In the third year the course will consist of lectures on Hydraulics, Pneumatics, machines and the resistance of materials. The drawings will consist of two projects on Civil Engineering.

For graduation, students of the third year will be required to hand in on or before April 15th, the following Project for a Road:



Let the distance A B be 10,000 feet. Let A and B be on the planes indicated by the lines of level.

Draw the cheapest road between A and B, having a slope of $\frac{1}{200}$. Show all the cuttings and fillings, bridge constructions, etc., carefully calculated, and contrasted with those of other possible routes so as to justify the direction chosen. Let the bridge or bridges be of stone, and let an elevation of one be drawn shaded, shadowed and colored.

NOTE.—These Memoirs and Projéts must be written on paper 8 × 10, with a margin of one inch, and be illustrated by drawings made to scale, on paper 24 × 36 in. in size.

MODERN LANGUAGES.

The design in this department is to teach the students how to read French and German scientific books with facility.

Instruction is given for four hours a week in each of these languages during the Preparatory Year, and two hours a week during the First Year, and in German one hour a week during the Second Year. As the text-books employed in the class-room are altogether works on science, the students can acquire a sufficient vocabulary to enable them to use French and German authors in all the departments of the school.

No attempt is made to produce accomplished scholars in all branches of German and French literature, but attention is concentrated upon the immediate wants of the young men. In this way no time is lost, and the instruction becomes thoroughly practical.

GENERAL CHEMISTRY.

The Preparatory Class attend three exercises a week in General Chemistry throughout the year. It is intended to lay the foundation of a thorough knowledge of the theory of the subject preliminary to the practical instruction in the chemical laboratory. For this purpose the class are drilled upon the lectures with free use of the best text-books. They are expected to write out full notes, which must be exhibited to the Professor at the close of each session. At the end of the year the class must pass a rigid examination before they can be admitted to a higher grade.

The first year students pursuing the courses of Geology and Natural History, or of Analytical and Applied Chemistry, also attend three times a week during the year in General Chemistry, and receive instruction in Theoretical Chemistry, adapted to the wants of special scientific students.

ANALYTICAL CHEMISTRY.

There is a laboratory devoted to Qualitative Analysis, another to Quantitative Analysis, and an Assay laboratory. These laboratories are provided with all the necessary apparatus and fixtures, and each is under the special charge of a competent assistant. Each student is provided with a convenient table with drawers and cupboards, and is supplied with a complete outfit of apparatus and chemical reagents.

During the first year Qualitative Analysis is taught by lectures and blackboard exercises, and the student is required to repeat all the experiments at his table in the laboratory. Having acquired a thorough experimental knowledge of the reactions of a group of bases or acids, single members of the group or mixtures are submitted to him for identification. He thus proceeds from simple to complex cases till he is able to determine the composition of the most difficult mixtures. Constant use is made of the Spectroscope in these investigations.

When the student shows on written and experimental examination that he is sufficiently familiar with Qualitative Analysis he is allowed to enter the Quantitative laboratory.

During the second and third years Quantitative analysis is taught by lectures and blackboard exercises, and the student is required to execute in the laboratory in a satisfactory manner a certain number of analyses. He first analyzes substances of known composition, such as crystallized salts, that the accuracy of his work may be tested by a comparison of his results with the true percentages.

These analyses are repeated till he has acquired sufficient skill to insure accurate results. He is then required to make analyses of more complex substances, such as coals, limestones, ores of copper, iron, zinc and nickel, pig-iron, slags, technical products, etc., cases in which the accuracy of the work is determined by duplicating the analyses, and by comparing the results of different analysts.

Volumetric methods are employed whenever they are more accurate or more expeditious than the gravimetric methods. In this way each student acquires practical experience in the chemical analysis of the ores and products which he is most likely to meet in practice.

Students pursuing the course of Analytical and Applied Chemistry are expected to execute the following quantitative analyses and determinations:

1.	Baric Chloride	(Ba, Cl, H_2O)
2.	Magnesic Sulphate	(MgO, SO_3, H_2O)
3.	Ammonia-iron-alum	($(NH_4)_2O$, Fe_2O_3, SO_3, H_2O)
4.	Potassic Chloride	(K, Cl)
5.	Hydro-disodic-phosphate	(Na_2O, H_2O, P_2O_5)
6.	Silver coin	(Ag, Cu, Pb, Au)
7.	Dolomite	(CaO, MgO, CO_2, SiO_2, Fe_2O_3)
8.	Bronze	(Cu, Sn)
9.	Coal	(Volatile matter, Fixed Carbon, ash, H_2O, S)
10.	Copper Pyrites	(Cu)
11.	Zinc Ore	(Zn)
12.	Type Metal	(Pb, Sb)
13.	Chromic Iron	(Cr_2O_3)
14.	Ilmenite	(TiO_2)
15.	Iron Ore	(complete analysis)
16.	Nickel Ore	(Ni, Co)
17.	Natrolite	(SiO_2, Al_2O_3, Na_2O, H_2O)
18.	Feldspar	(SiO_2, Al_2O_3, K_2O, Na_2O)

19. Slag (SiO_2, Al_2O_3, CaO, MgO, FeO, SO_3,P_2O_5, S)
20. Guano (P_2O_5, CaO, MgO, Fe_2O_3, SiO_2, H_2O, NH_3, SO_3, organic matter)
21. Superphosphate of Lime (P_2O_5, soluble and insoluble)
22 Pig Iron (Fe, Mn,Graphite, Combined C, P, S, Si)
23. Alkalimetry
24. Acidimetry
25. Chlorimetry
26. Pyrolusite (MnO_2)
27. Specific Gravity of a Solid
28. " " " Liquid
29. " " " Gas
30. " " " Vapor
31. Sugar (C, H, O)
32. Uric Acid (C, H, N, O)
33. Oil of Turpentine (C, H)
34. Water (CaO, MgO, Na, K, SO_3, Cl, SiO_2, organic matter
35. Urine (qualitative and quantitative)
36. Milk (water, butter, casein, sugar, ash)
37. Raw Sugar (water, crystallizable cane sugar, grape sugar, ash)
38. Illuminating Gas (Illuminating power, Sp. Gr., S, condensation by Br.)
39. Petroleum (fractional distillation, gravities, fire test, illuminating power.)
40. Gas Coal (quantity and quality of gas.)
41. Building Stones Physical tests.
42. Mortars " "
43. Fire Clays " "

Students pursuing the other courses of study, are expected to execute certain of the above quantitative analyses and determinations as follows: in the course of

1. Civil Engineering, Nos. 1, 2, 3, 4, 5, 6, 7, 27, 28, 29, 34, 41, 42.
2. Mining Engineering, Nos. 1, 2, 3, 4, 5, 6, 7, 9, 10, 15, 19, 22, 27, 28, 29, 41, 42, 43.
3. Metallurgy, Nos. 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14, 15, 16, 19, 22, 27, 28, 29, 41, 42, 43.
4. Geology and Natural History, Nos. 1, 2, 3, 4, 5, 6, 7, 9, 15, 17, 18, 26, 27, 28, 29, 34, 39, 40 and 41, 42, 43, including analyses as well as physical tests.

STOICHIOMETRY.

Stoichiometry, the arithmetic of Chemistry, is taught in a special course of lectures and blackboard exercises during the second session of the first year.

ASSAYING.

During the third year the student is admitted to the Assay laboratory, where he is provided with a suitable table and a set of Assay apparatus; and where he has access to crucible and muffle furnaces, and to volumetric apparatus for bullion assay by the wet process. The general principles as well as the special methods of assaying are explained in the lecture-room, and at the same time the ores of the various metals are exhibited and described. The student is then supplied with suitable material, ores of known composition, and is required to make assays himself. He first receives ores of lead, the sulphide, carbonate, and phosphate, which he mixes with the proper fluxes, and heats in the furnace, obtaining a button of lead, which he carefully weighs, thus determining the percentage of metal in the ore. He then determines by cupellation the amount of silver in the lead. Silver ores are next given to him, at first those which are most easily assayed, such as the mixtures of chloride of silver with quartz; afterwards more complex ores, such as galena, ruby silver ore, mispickel, fahlerz, etc. These he is required to assay both in the crucible and in the scorifier.

Ores of gold are next supplied, auriferous quartz, slates, pyrites, blende, etc., which are assayed by the most reliable methods.

To facilitate the assay of ores of the precious metals a system of weights has been introduced, by which the weight of the silver or gold globule obtained in the assay shows at once, without calculation, the number of troy ounces in a ton of ore. The student then passes on to the assay of silver and gold bullion, the former by Gay Lussac's volumetric method, the latter by "quartation" or "parting."

Ores of tin, antimony, and iron, are then assayed by the dry methods, when the course is completed. Each student thus executes two or three hundred assays himself, under the immediate supervision of the instructor.

ORDER OF ASSAYS.

LEAD.

1.—Carbonate of Lead.
2.—Sulphate of Lead.
3.—Pyromorphite.

GOLD AND SILVER, CRUCIBLE ASSAY.

1.—Simple ores.
2.—Complex ores.—Containing As, Zn Sb, FeS_2 CuS.

GOLD AND SILVER, SCORIFICATION ASSAY.

1.—Basic Ores.
2.—Acid Ores.
3.—Arsenical Ores.
4.—Antimonial Ores.
5.—Copper Pyrites.
6.—Iron Pyrites.
7.—Zinc Blende.
8.—Mixtures.

BULLION ASSAY.

1.—Four Silver Coins; in duplicate.
2.—Two Gold Coins; "

IRON.

1.—Pure ores.—Magnetite, Hematite, Limonite and Siderite. Composition known. Four assays in duplicate.
2.—Impure ores.—Magnetite, Hematite, Limonite and Siderite. Composition known. Four assays in duplicate.
3.—Unknown ores. Two assays in duplicate.

ANTIMONY.

1.—Stibnite. Five assays.

TIN.

1.—Cassiterite. Four assays by different methods.

APPLIED CHEMISTRY.

The instruction in Applied Chemistry extends through the second and third years. and consists of lectures, illustrated by experiments, diagrams and specimens.

The subjects discussed are:

I. Chemical Manufactures: acids, alkalies, and salts.

(1.) Sulphur, sulphurous acid, hyposulphites, sulphuric acid, bisulphide of carbon, etc.
(2.) Common salt, soda ash, hydrochloric acid, chlorine, binoxide of manganese, bleaching powder, chlorates, chlorimetry, etc.
(3.) Carbonate of potash, caustic potash, alkalimetry, acidimetry, etc.
(4.) Iodine, bromine, etc.
(5.) Sodium, aluminium, magnesium.
(6.) Phosphorus, matches, etc.
(7.) Nitrates of potash and soda, gunpowder, gun-cotton, nitro-glycerine, etc.
(8.) Ammonia salts.
(9.) Cyanides.
(10.) Alum, copperas, blue vitriol, salts of magnesia, baryta, strontia, etc.
(11.) Borates, stannates, tungstates, chromates, etc.
(12.) Mercury salts, silver salts, photography.
(13.) Electro-metallurgy.
(14.) Oils, fats, soaps, glycerine.
(15.) Pigments, paints, essential oils, resins, varnishes, inks.

II. Glass, Porcelain, and Pottery.

III. Limes, Mortars, Hydraulic Cements, Gypsum, Lutes, Putty, etc.

IV. Fuel and its applications.

V. Artificial Illumination: candles, oils, and lamps, petroleum, gas and its products.

VI. Food and drink: water, milk, cereals, starch, bread, meat, tea, coffee, sugar, fermentation, wine, beer, spirits, vinegar, preservation of food, tobacco, etc.

VII. Clothing: textile fabrics, bleaching, dyeing, calico printing, paper, tanning, glue, india-rubber, gutta-percha, etc.

VIII. Fertilizers: guano, superphosphates, poudrettes, etc.

IX. Disinfectants, Antiseptics, Preservation of Wood, etc.

During the vacation at the close of the second year, students in the course of Analytical and Applied Chemistry will be required to prepare a memoir on one of the following subjects: (1,) Coal Tar Products. (2,) Madder, and its applications in the arts. (3,) Tobacco. (4,) The Ceramic arts as practised in America; to be handed in on or before November 1st; and for graduation, students of the third year will be required to hand in on or before the 15th April the following Projét:

An Establishment to produce daily 400 carboys of Sulphuric Acid.

The raw material may be either crude sulphur, iron or copper pyrites. If the latter be employed, the copper must be extracted by some chemical process, and may be sold as cement copper or may be refined and sold as ingot copper. 200 carboys of the daily production may be sold as acid of 60° Baumé, the rest must be oil of vitriol.

The Projét will comprise:

I. MEMOIR; II. ESTIMATES; III. DRAWINGS.

I. The Drawings will include:

1st. A general plan and elevations of the Works, showing the situations of all the buildings, furnaces, acid chambers, boilers, concentrating and other apparatus.

2d. Details of the furnaces.

3d. Details of the acid chambers.

4th. Details of the concentrating apparatus.

5th. Details of extra apparatus used for the extraction of copper.

The Drawings, in fine, will include sections and elevations sufficient to show in detail all the important points in the construction and arrangement of the Works.

II. The Estimates will give the cost of the ground, and the cost in detail, of all the buildings, furnaces, acid chambers, tools, etc., etc.: the cost of each operation in full, and also a detailed statement of the same referred to the ton of raw material, and to the carboy of acid. The interest on the capital invested will be calculated at 10 per cent. and on the Rolling Capital at 7 per cent.

III. The Memoir will give the reasons for choice of raw material, for the adoption of the method employed, and for the location of the Works, with reference to raw material and a market, together with a detailed description of the whole process.

NOTE.—These Memoirs and Projéts must be written on paper 8x10, with a margin of one inch, and be illustrated by drawings made to scale, on paper 24x36 in. in size, and accompanied when possible by specimens.

MINERALOGY.

The studies of the department of Mineralogy continue through two years. In the first year the students are instructed in Crystallography and the use of the Blowpipe. The lectures on Crystallography are illustrated by models, which the students are required to determine under the eye of the Professor. A collection of glass models and of models in wood, illustrating all of the important, actual, and theoretical forms, is always accessible to the students. The exercises in Blowpipe determination are entirely practical. Known mixtures are first given to the student to examine, and, when he is sufficiently familiar with them, unknown mixtures are determined.

In the second year the lectures are illustrated by conferences, where the student is required to determine minerals by their physical and blowpipe characters, and, in the case of the metallic minerals, to determine their constituents. The student thus obtains a thorough knowledge of both Qualitative and Quantitative Blowpipe Analysis. The Mineralogical cabinet contains about 10,000 specimens in glass cases, which are labelled and open to the public. Besides this there is a collection of about 2,000 specimens, to which the students have unrestricted access.

GEOLOGY.

The course of instruction in this department is as follows:

First Year.

Botany and Zoology as an introduction to Palæontology—lectures throughout the year.

During the vacation at the close of the First year, students pursuing the course in Geology and Natural History are required to prepare a Memoir on one of the following subjects, to be handed in on or before Nov. 1:

(1,) Notes on the Flora or Fauna of any Geographical District visited. (2,) Observations on the structure, distribution and habits of any of our fresh-water fishes. (3,) Catalogues and collections of Mollusks inhabiting any lakes, rivers or districts. (4,) Notes on the economy of observed insects. (5,) Notes on the various observed methods by which the seeds of plants are distributed.

Second Year.

Lithology: Minerals which form rocks and rock masses of the different classes —lectures and practical exercises.

Geology—Cosmical, Physiographic, and Historical—lectures throughout the year.

During the vacation at the close of the second year, students pursuing the course of Geology and Natural History are required to prepare a memoir on one of the following subjects, to be handed in on or before November 1st:

(1.) Report on the Geology of any district visited, embracing: *a.* Topographical features and their cause. *b.* Surface Geology. *c.* Sections of Strata with lithological character, thickness, dip, strike and fossils of each bed. Sketches of rock outcrops. *d.* Suite of specimens of rocks and fossils, rocks 3 × 4 × 1 inches.

(2.) Report on any special formation which may be examined, embracing: *a.* The geographical area of its outcrops. *b.* Its mineral character, and origin of the material composing it. *c.* List and collection of its fossils. *d.* Reading of the history of its deposition.

(3.) Report on any examined deposit of ores or other useful minerals: as *a.* The Magnetic Iron ores of New York and New Jersey, phenomena and history. *b.* The Limonite ores of the Alleghany Belt, character of deposits and age. *c.* The Zinc ores of Franklin or Friedensville. *d.* The Chromic Iron of the Alleghany Belt, where and how it occurs.

THIRD YEAR.

Economic Geology: Theory of Mineral Veins; Ores, Deposits and Distribution of Iron, Copper, Lead, Zinc, Gold, Silver, Mercury, and other metals; Graphite, Coal, Lignite, Peat, Asphalt, Petroleum, Salt, Clay, Limestone, Cements, Building and Ornamental Stones, etc.

Palæontology: Systematic review of recent and fossil forms of life—lectures throughout the year.

For graduation in the course of Geology and Natural History, students will be required to present on or before the 15th of April, a Dissertation on one of the following subjects:

(1.) The Mesozoic Sandstones of New Jersey and the Connecticut Valley; their geological phenomena, history, and relations to the associated trap rocks.

(2.) The Limonite Iron Ores of the Alleghany Belt; their phenomena, age, and origin, *i. e.*, Where and how they occur, when and how they were deposited.

(3.) Eozoon Canadense; is it organic?

NOTE.—These Memoirs and Dissertations must be written on paper 8×10, with a margin of one inch, and be illustrated by drawings made to scale, on paper 24×36 in. in size, and accompanied when possible by specimens.

METALLURGY.

The Metallurgical course includes lectures on the preparation of fuels, construction of furnaces, the manufacture of metals, projéts and estimates for the erection of metallurgical works. The lectures cover a period of two years, and discuss in detail the methods in use in the best establishments in this country and in Europe for the working of ores, with practical details of charges, labor, and cost of erection obtained from the most authentic sources. Special attention is given to ores of this country which are difficult to treat, and to the solution of practical problems which are likely to occur. The lectures are illustrated by models, drawings of furnaces, and by collections of metallurgical products obtained from works in this country and Europe.

During the vacation at the close of the second year students who pursue either the course of Mining Engineering or Metallurgy will be required to prepare a Memoir on one of the following subjects: Different methods of roasting Copper ores; Desilverization of Lead by Metallic Zinc. To be handed in on or before November 1st.

PROJÉTS.

The projéts assigned to the students familiarize them with the method of making plans and estimates for the erection of works. The ore to be worked and the various conditions which are required are given to the student at the close of the second year. During the summer vacation he is expected to visit works, and to ascertain what the practical requirements are. During the third year the drawings, estimates, and descriptions of the processes are completed, and submitted for inspection and approval.

The following projét will be executed by the students who graduate in 1873, in the courses of Mining Engineering or Metallurgy, to be handed in on or before the 15th of April:

Metallurgical Projét: an establishment to treat annually 6,000 tons of Argentiferous Galena.

The ore will contain 65 per cent. of lead, 0.5 per cent. of copper, 2 per cent. of zinc, 13 per cent. of quartz, mixed with ferruginous material, and 26 grammes of silver to the 100 kilo. Fuel will be scarce and expensive.

The works will be situated on ground which slopes 11 centimetres to the metre, at the head of which there will be a plateau and at the bottom a mill stream.

The lead will be desilverized at the works. The copper must be extracted, and a market may be supposed either for sulphate of copper or metallic copper, or any intermediate product.

The Projét will comprise:

I. MEMOIR; II. ESTIMATES; III. DRAWINGS.

I. The Memoir will give the description of the locality selected, and the reasons for its selection; the reasons for the choice of the method, and a description of the reactions in the different processes used.

II. The Estimates will give the cost in detail of all the buildings, furnaces, machines and tools used. The cost of each operation must be given in full, and a detailed statement of the cost referred both to the ton of ore and to the ton of metal. The sinking fund will be established on the supposition that the supply of ore will hold out for fifteen years. The interest on the working capital will be counted at seven per cent. The sales will be made with six months' credit, or the usual discount for cash.

III. The Drawings will include:

1st. An elevation, horizontal and vertical section of the working furnaces.

2d. An elevation, horizontal and vertical section of the reducing furnaces.

3d: Plan, sections and elevation of the desilverizing works.

4th. A general plan of the works, showing the position of all the buildings, furnaces, machines, etc.

NOTE.—These Memoirs, Journals, and Projéts must be written on paper 8×10, with a margin of one inch, and be illustrated by drawings made to scale, on paper 24×36 inches in size, and accompanied, when possible, by specimens.

MINING ENGINEERING.

Mining engineering is taught during the second year. The instruction comprises a course of lectures illustrating the theory and practice of mining operations at home and abroad; giving the general principles of reconnoitring and surveying mineral property and mines; the attack, development, and administration of mines and the mechanical preparation of ores, with the exhibition and use of all necessary reconnoitring and surveying instruments, particularly the mining theodolite, and the exhibition of various models.

In surveying, the student is taught to make surface and subterranean surveys, to direct and adjust his works; also the solution of some problems of underground surveying by descriptive geometry, and many special examples of determining lines on the surface corresponding to given lines below, etc.

Attack describes the miners' method; the use of drills, picks, powder, nitroglycerine and new explosives, compressed air, etc.; the proper location and construction of tunnels, slopes, shafts, wells for sounding, Artesian wells, salt and oil wells; preceded by a theory and description of the most typical veins, true or irregular, and other deposits of ore, salt, coal, and oil, exemplified at home and abroad.

Development includes the description of the best methods in experience of laying out subterranean works for production and conservation in the present and future; for proper and economic ventilation, transportation, hoisting, pumping or draining, distribution of workmen, etc.

Administration includes a review of the foregoing, with regard to a concentration of ideas and a general comparison of production cost to market price of untreated ore.

Here the student is taught to forecast the expense of the establishments he must make; their annual cost; the cost of miners, employees, machines, material, etc.; and offset these with the result of production, so endeavoring to solve the problem of making a given mine pay in given circumstances, by scientific attack, distribution, and general rational economy.

Mechanical preparation describes the various accepted methods of reducing massive ore to a condition either yielding metal or fitting the material for metallurgical processes. Models of stamps, crushers, shaking tables, sluices, etc., are exhibited, with plans and sections of mills, and coal-breakers at home and abroad.

During the vacation at the close of the second year, students pursuing the course of Mining Engineering will be required to prepare a Memoir on Underground Transportation, Cages, and Parachutes, to be handed in on or before November 1st. For graduation in 1873, in the course of Mining Engineering, third year students will execute the following Projét, to be handed in on or before April 15th.

I. Projét for Pumping Machinery for a Mine.

Assume a shaft 250 metres deep, out of which one cubic metre of water is to be pumped per minute. Determine a system of pumps for this effect, and let them be moved by a Water pressure Engine. Calculate the dimensions of the Engine, assuming for it a head of water equal to 60 met., the main rod, the pump rods, pumps and pipes. Draw a section and elevation of the Engine, also of both kinds of pumps, and the ensemble of pumps and Engine in elevation.

NOTE.—These Memoirs, Journals, and Projéts must be written on paper 8 × 10, with a margin of one inch, and be illustrated by drawings made to scale, on paper 24 × 36 inches in size, and accompanied, when possible, by specimens.

MACHINES.

The course of machines, which is inseparable from that of mining engineering, is given during the third year. It teaches the theory of the machines used in mining works. It is the application of mechanics to the construction of water-wheels, turbines, wind-mills, steam and heat engines, pumps, and ventilators, transmission of force by compressed air, and the formulæ with their theory for the resistance of materials. Models of water-wheels, steam-cylinders, steam-engines, blowing-machines, etc., are exhibited.

In the resistance of materials the calculations are shown for the sections of different parts of machines, the fly-wheel, pump rods, connecting rods, etc., also for such constructions as retaining walls, arches, timbering, supports, etc. The course of the third year also includes a plan of drawing and estimates for some projected work of mining, or the construction of a machine for some of the uses of mining. This system of projéts is to the young engineer a real practical application of all his three years' study, by which he is made to investigate prices, compare theories, models, methods, and dispositions, and in competing with his class to take pains to furnish the best arguments, illustrations, and calculations, he can, in order to support his views.

VACATION WORK.

JOURNAL OF TRAVELS AND MEMOIRS.

During the vacations, at the close of the first and second years, students will be required to prepare memoirs on subjects assigned to them by the Faculty, and Journals of Travel, containing descriptions of mines and Metallurgical or Chemical works visited, and any interesting mineralogical or geological observations they may make. These are to be handed in on or before November 1st.

These Memoirs and Journals must be based upon the personal examination of works in actual operation. They must be written on paper 8 × 10, with a margin of one inch, and be illustrated by drawings made to scale, on paper 24 × 36 inches in size, and accompanied, when possible, by specimens, which should be at least 3 in. × 4 in. in size, and labelled. Mention must be made of works visited and books consulted.

As the Memoirs and Journals are bound into volumes for preservation at the School, whole (not half) sheets of paper should be used, and no holes should be made for ribbon or other fastenings.

The following subjects for memoirs were assigned for the vacation of 1872:

For Students who had Completed the First Year.

1. Those pursuing the course of Civil Engineering: Caissons and Bridge Foundations.

2. Those pursuing the course in Mining Engineering: Cables, Drums, and Reels for hoisting.

3. Those pursuing the course in Metallurgy, either: Modern Chemical Notation; Oxygen; Ammonia; the Chemical Industries, based upon Phosphoric acid and Phosphates.

4. Those pursuing the course in Geology and Natural History, either of the following:

(1.) Notes on the Flora or Fauna of any Geographical District visited. (2.) Observations on the structure, distribution, and habits of any of our fresh water fishes. (3.) Catalogues and collections of Mollusks inhabiting any lakes, rivers or districts. (4.) Notes on the economy of observed insects. (5.) Notes on the various observed methods by which the seeds of plants are distributed.

5. Those pursuing the course in Analytical and Applied Chemistry, either: Modern Chemical Notation; Oxygen; Ammonia; Industries based upon Phosphoric acid and Phosphates.

FOR STUDENTS WHO HAD COMPLETED THE SECOND YEAR.

1. Those pursuing the course in Civil Engineering: Draw and Turning Bridges, and Cables for Suspension Bridges.

2. Those pursuing the course in Mining Engineering: Underground Transportation, Cages, and Parachutes.

3. Those pursuing the course in Metallurgy, either of the following: (1.) Different methods of roasting Copper Ores. (2.) Desilverization of Lead by Metallic Zinc.

4. Those pursuing the course in Geology and Natural History, either of the following:

(1.) Report on the Geology of any district visited. Embracing: *a.* Topographical features and their cause. *b.* Surface Geology. *c.* Sections of Strata with lithological character, thickness, dip, strike, and fossils of each bed. Sketches of rock outcrops. *d.* Suite of specimens of rocks and fossils, rocks 3 × 4 × 1 inches.

(2.) Report on any special formation which may be examined. Embracing: *a.* The geographical area of its outcrops, *b.* Its mineral character and origin of the material comprising it. *c.* Sets and collections of its fossils. *d.* Reading of the history of its deposition.

(3.) Report on any examined deposits of ores or any other useful minerals: as, *a.* The magnetic Iron ores of New York and New Jersey, phenomena and history. *b.* The Limonite ores of the Alleghany Belt, character of deposits and age. *c.* The Zinc ores of Franklin or Friedensville. *d.* The Chromic Iron of the Alleghany Belt, where and how it occurs.

5. Those pursuing the course of Analytical and Applied Chemistry, either of the following: (1.) Coal Tar Products. (2.) Madder, and its application in the arts. (3.) Tobacco. (4.) The Ceramic arts as practised in America.

TEXT-BOOKS.

Books preceded by an asterisk (*) are optional—the others indispensable.

PREPARATORY YEAR.

Davies' University Algebra.
Davies' Legendre.
Ganot's Principles of Physics.
Roscoe's Chemistry, English edition.
Comfort's German Grammar.
Jewett's Ollendorff's French Grammar.
Montmahou's Cours d'Histoire Naturelle—Année préparatoire.
Regnault-Strecker's Lehrbuch der Chemie.

FIRST YEAR.

Davies' Analytical Geometry.
Peck's Differential and Integral Calculus.
Davies' Descriptive Geometry.
Davies' Shades and Shadows.
Mahan's Stone Cutting.
Fresenius's Qualitative Analysis.
Plattner's Blowpipe Analysis.
Egleston's Diagrams of Crystals.
Gray's Lessons in Botany.
*Gray's Manual of Botany.
Nicholson's Manual of Zoology.
Fasquelle's French Grammar.
Regnault-Strecker's Lehrbuch der Chemie.
Beudant's Geologie.

SECOND YEAR.

Peck's Mechanics (New edition).
Mahan's Civil Engineering.
Johnson's Fresenius's Quantitative Analysis.
Dana's Manual of Geology.
*Wagner's Chemical Technology.
*Kerl's Metallurgy.
Plattner's Blowpipe Analysis.
*Egleston's Lectures on Mineralogy.
Egleston's Tables for Determining Minerals.
Egleston's Metallurgical Tables.
*Cotta's Lithology.
Wood's Strength of Materials.
Davies' New Surveying.

THIRD YEAR.

*Burat's Geologie Appliqué.
*D'Orbigny's Paleontologie Elementaire.
*Mitchell's Manual of Practical Assaying.
*Whitney's Metallic Wealth of the U. S.
*Kerl's Probirkunst.
Egleston's Metallurgical Tables.
*Cotta's Treatise on Ore Deposits, by Primo.
Vinton's Notes on Machines.
Vinton's Strength of Materials.

GENERAL INFORMATION.

VACATIONS.

There is a recess in December and one in February, and a vacation from the middle of June to the first Monday in October.

EXCURSIONS.

During the session, the students may visit the different machine-shops and metallurgical establishments of the city and its environs.

During the vacation, each student is expected to visit mines, metallurgical and chemical establishments, and to hand in, on his return, a journal of his travels, and a memoir on some subject assigned him. He is also required to bring collections, illustrating his journal and memoir, which collections are placed in the museum, reserved as a medium of exchange, or made use of in the laboratories.

For pupils who have been proficient, and who desire to devote special attention to any one branch, application will be made for permission to work in particular mines or manufactories. This will be done only as the highest reward of merit that the institution can give.

LIBRARY.

A Special Scientific Library has been provided for the use of the students of the school, which already numbers two thousand volumes, and is rapidly increasing. The following periodicals are regularly received:

Abhandlungen der K. K. Geologischen Reichsanstalt. Wien.
American Artisan. New York.
American Association, The Reports of the.
American Chemist. New York.
American Gaslight Journal. New York.
American Journal of Science. New Haven.
American Railroad Journal. New York.

ANNALEN DER CHEMIE UND PHARMACIE. Liebig und Wöhler. Leipzig und Heidelberg.
ANNALEN DER PHYSIK UND CHEMIE. Poggendorf. Berlin.
ANNALES DE CHIMIE ET DE PHYSIQUE. Paris.
ANNALES DE GENIE CIVILE. Paris.
ANNALES DES MINES. Paris.
ANNUAL OF SCIENTIFIC DISCOVERY. Boston.
ANTHONY'S PHOTOGRAPHIC BULLETIN.
ARCHIV FUER MIKROSKOPISÇHE ANATOMIE. Bonn.
BERG-UND HUETTENMÄNNISCHES JAHRBUCH. Wien.
BERG-UND HUETTENMANNISCHES ZEITUNG. Leipzig.
BERICHTE UEBER DIE FORTSCHRITTE DER EISENHÜTTEN-TECHNIK. Leipzig.
BERICHTE DER DEUTSCHEN CHEMISCHEN GESELLSCHAFT ZU BERLIN.
BIBLIOGRAPHIE DES INGENIEURS, DES ARCHITECTES, ETC. Paris.
BIBLIOTHECA HISTORICO-NATURALIS. Göttingen.
BOSTON JOURNAL OF CHEMISTRY. Boston.
BRITISH ALMANAC AND COMPANION. London.
BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Reports. London.
BRITISH JOURNAL OF PHOTOGRAPHY.
BULLETIN OF THE AMERICAN IRON AND STEEL ASSOCIATION. Philadelphia.
BULLETIN OF THE ESSEX INSTITUTE.
BULLETIN DE LA SOC. IND. DE MULHOUSE.
BULLETIN DU MUSÉE DE L'INDUSTRIE. Bruxelles.
BULLETIN DE LA SOCIETE GEOLOGIQUE DE FRANCE. Paris.
BULLETIN DE LA SOCIETÉ DE L'INDUSTRIE MINERALE. Paris.
BULLETIN MENSUEL DE LA SOCIETE CHIMIQUE DE PARIS.
CANADIAN NATURALIST AND GEOLOGIST. Montreal.
CHEMICAL NEWS. London.
CHEMISCH-PHARMACEUTISCHES CENTRAL-BLATT. Leipzig.
CHEMISCH TECHNISCHEN MITTHEILUNGEN. Elsner. Berlin.
COMPTES RENDUS DE L'ACADEMIE DES SCIENCES. Paris.
DAILY WEATHER REPORTS AND MAPS OF U. S. SIGNAL SERVICE.
DEPARTMENT OF AGRICULTURE. Monthly Reports. Washington.
ENGINEERING. London.
ENGINEERING AND MINING JOURNAL. New York.
ERFAHRUNGEN IM BERG-UND HÜTTENMÄNNISCHEN MASCHIN BAU-UND AUFBEREITUNGSWESEN. Wien.
GEOLOGICAL MAGAZINE. London.
HARDWICKE'S SCIENCE GOSSIP. London.
IRON AGE. New York.
INDUSTRIE-BLÄTTER. Hager u. Jacobsen. Berlin.

JAHRBUCH DER KAISERLICH-KÖNIGLICHEN GEOLOGISCHEN REICHSANSTALT. Wien.

JAHRESBERICHT UEBER DIE FORTSCHRITTE DER CHEMISCHEN TECHNOLOGIE. Prof. J. R. Wagner. Leipzig.

JAHRESBERICHT UEBER DIE FORTSCHRITTE DER CHEMIE. Giessen.

JOURNAL OF APPLIED CHEMISTRY. New York.

JOURNAL OF THE CHEMICAL SOCIETY. London.

JOURNAL FUER PRACTISCHE CHEMIE. Leipzig.

JOURNAL OF THE FRANKLIN INSTITUTE. Philadelphia.

JOURNAL OF GAS LIGHTING. London.

JOURNAL OF THE IRON AND STEEL INSTITUTE. London.

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JOURNAL DE PHARMACIE ET DE CHIMIE. Paris.

LE MONITEUR SCIENTIFIQUE. Quesneville. Paris.

LE NATURALISTE CANADIEN. Montreal.

LE TECHNOLOGISTE. Paris.

LES MONDES. Paris.

LYCEUM OF NATURAL HISTORY OF THE CITY OF NEW YORK, ANNALS OF THE.

LYCEUM OF NATURAL HISTORY OF THE CITY OF NEW YORK, PROCEEDINGS OF THE.

MANUFACTURER AND BUILDER. New York.

MECHANICS' MAGAZINE. London.

MONTHLY MICROSCOPICAL JOURNAL. London.

MONTHLY REPORTS OF THE DIRECTOR OF THE BUREAU OF STATISTICS. Washington.

NATURE. London.

NEUES JAHRBUCH FÜR MINERALOGIE, GEOLOGIE UND PALÆONTOLOGIE. Stuttgart.

NEW YORK STATE AGRICULTURAL SOCIETY JOURNAL. Albany.

OESTERREICHISCHE ZEITSCHRIFT FÜR BERG-UND HÜTTENWESEN. Wein.

PALÆONTOGRAPHICAL SOCIETY. London.

PHILOSOPHICAL MAGAZINE. Edinburgh and London.

PHOTOGRAPHISCHE MITTHEILUNGEN. Berlin.

POLYTECHNISCHES CENTRAL-BLATT. Leipzig.

POLYTECHNISCHES JOURNAL. Drs. J. G. and E. M. Dingler. Augsburg and Stuttgart.

POLYTECHNISCHES NOTIZBLATT. Mainz.

PROCEEDINGS OF THE ESSEX INSTITUTE. Salem, Mass.

QUARTERLY JOURNAL OF SCIENCE. London.

QUARTERLY JOURNAL OF THE GEOLOGICAL SOCIETY. London.

RAILROAD GAZETTE. New York and Chicago.

REVUE DES COURS SCIENTIFIQUES. Paris.

REVUE UNIVERSELLE DES MINES, DE LA METALLURGIE, ETC. Paris.

SCIENTIFIC AMERICAN. New York.

Scientific Press. San Francisco.
Smithsonian Institute Reports. Washington.
" Miscellaneous Collections. Washington.
The Commissioners of Patents Journal. London.
The Free Trader. New York.
The Stockholder. New York.
The Technologist. New York.
Transactions of the Academy of Science of St. Louis.
United States Railroad and Mining Register. Philadelphia.
Van Nostrand's Eclectic Engineering Magazine. New York.
Verhandlungen der K. K. Geologischen Reichsanstalt. Wein.
Wall Street Journal. New York.
Year Book of Facts. London.
Zeitschrift für Chemie. Leipzig.
Zeitschrift der Deutschen Geologischen Gesellschaft. Berlin.
Zeitschrift des Vereines Deutscher Ingenieure. Berlin.
Zeitschrift fuer Analytische Chemie. Dr. O. R. Fresenius. Wiesbaden.
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CABINETS.

Collections of specimens and models illustrating all the subjects taught in the school are accessible to the students, including:

Crystal Models,
Natural Crystals, Pseudomorphs,
Ores and Metallurgical Products,
Models of Furnaces,
Collection Illustrating Applied Chemistry,
Fossils,
Economic Minerals,
Rocks,
Olivier's Models of Descriptive Geometry,
Models of Mining Machines,
Models of Mining Tools.

CRYSTAL MODELS.

The lectures on Crystallography are illustrated by a collection of 150 models in glass, which show the axis of the crystals and the relation of the derived to the primitive form. This suite is completed by 400 models in wood, showing most of the actual and theoretical forms.

MINERALS.

The cabinet of minerals comprises about 10,000 specimens arranged in table cases. It includes a large suite of pseudomorphs, and a collection illustrating

Crystallography by natural crystals, showing both their normal and distorted form. The minerals are accompanied by a large collection of models in wood, showing the crystalline form of each. Arranged in wall cases are large specimens, showing the association of the minerals.

The greater part of this valuable collection was presented to the school by Gouverneur Kemble, and R. P. Parrott, of Cold Spring, N. Y., and G. T. Strong, W. H. Aspinwall, Morris K. Jessup, D. S. Egleston, John Caswell, W. E. Dodge, Jr., Charles Lanier, and J. Crearer, of this city.

ORES AND METALLURGICAL PRODUCTS.

A very complete collection of metallurgical products, illustrating the different stages of the type process in use in the extraction of each metal in this country and Europe, is accessible to the students. This collection is constantly increasing. Most of the specimens have been analyzed and assayed.

MODELS OF FURNACES.

An extensive collection of models of furnaces has been imported from Europe. A very large number of working drawings of furnaces and machines used in the different processes are always accessible to the students.

COLLECTION ILLUSTRATING APPLIED CHEMISTRY.

Several thousand specimens of materials and products illustrating applied chemistry have already been collected. These are now contained in cases and drawers, and are available for use at the lectures. It is designed, as soon as practicable, to arrange a cabinet of industrial chemistry, where these specimens will be exhibited under glass, so that they may always be exposed for inspection, as is now the case with the geological and mineralogical collections.

GEOLOGICAL COLLECTION.

This consists of over sixty thousand specimens, forming the following groups:

1st. A systematic series of the rocks and fossils characteristic of each geological epoch, numbering over twenty thousand specimens.

2d. A collection of ores, coals, oils, clays, building materials, and other useful minerals, illustrative of the course of lectures on Economic Geology, and believed to give the fullest representation of our mineral resources of any collection yet made.

3d. A collection of five thousand specimens of rocks, and the minerals which form rocks, to illustrate the lectures on Lithology.

4th. A Palæontological series, which includes collections of recent and fossil vertebrates, articulates, mollusks, radiates, and plants. In this series is to be found the largest collection of fossil plants in the world, including many remarkably large and fine specimens, and over two hundred new species of which representatives are not known to exist elsewhere. Also, the most extensive series of fossil fishes in the country, including, among many new and remarkable forms, the only specimens known of the gigantic *Dinichthys;* a suite of Ward's casts of extinct saurians and mammals; a fine skeleton of the great Irish elk, etc., etc.

MODELS OF DESCRIPTIVE GEOMETRY, AND MACHINES.

The Olivier models, forming all mathematical surfaces by silk threads, and admitting of a variety of transformations; also other models illustrating general and special problems of descriptive geometry, shades and shadows, and stone cutting, drawings of machines and parts of machines for studying and copying; also landscapes, in crayon and in water color, for instruction in sketching; models of mining machines and mining tools, stationary steam-engines, single and double cylinders, sections of steam-cylinders, water-wheels, turbines, shaking-tables, stamps, crushers, blowing machines, pumps, etc.

MACHINE EOR TESTING THE STRENGTH OF MATERIALS.

A machine for testing the resistance of materials to transverse, tensile, and crushing strains has been ordered from the celebrated house of Fairbanks & Co. for the use of the departments of Civil and Mining Engineering.

The machine is to be constructed so as to apply and accurately weigh strains of from 5 lbs. to 50 tons. It will be readily adjustable to specimens of a great variety of size and shape, and is intended to be in general applicability and delicacy of determination one of the most perfect machines of the kind ever made. The School will conduct series of experiments to obtain results which will be of value to all Engineers and Constructors, particularly in consideration of American irons, for which the public interests now demand more special and extended tables.

ASTRONOMICAL OBSERVATORY.

An Astronomical Observatory has lately been erected, which will contain an alt-azimuth instrument, made by Troughton and Simms; an equatorial, with clock work, etc., to which is attached a spectroscope, by Alvan Clarke and Sons, having the dispersive power of a battery of fourteen flint glass prisms, each with an angle of fifty-five degrees. In addition to these instruments, the observatory will be provided with every thing necessary to a course of instruction in Geodesy, including the accurate determination of time, longitude, and latitude.

It is designed to use the large spectroscope for the study of solar and stellar physics.

TORREY PRIZES.

A friend of the school offers a prize of fifty dollars to the student of the first year who passes the best written and experimental examination in Qualitative Analysis.

And fifty dollars to the student of the school who gives evidence of the most thorough knowledge of the theory and practice of Assaying.

These prizes are called the Torrey Prizes in honor of Dr. John Torrey.

DEGREES.

Those who complete the required courses of studies will receive the degree of Engineer of Mines, Civil Engineer, or Bachelor of Philosophy.

NECESSARY EXPENSES OF A STUDENT ATTENDING THE SCHOOL OF MINES.

1.—PREPARATORY YEAR.

	MINIMUM.		MAXIMUM.
Fees of the School	$200		$200
Text Books	12	to	15
Drawing Instruments, etc.	15	to	25
Board, Washing, Fire, and Light (about 35 weeks)	280	to	400
Total	$507		$640

2.—FIRST YEAR.

Fees of the School	$200		$200
Text Books	20	to	25
Drawing Materials	3	to	5
Apparatus	12	to	25
Board, etc	280	to	400
Total	$515		$655

3.—SECOND YEAR.

Fees of the School	$200		$200
Text Books	20	to	25
Drawing Materials	3	to	5
Apparatus	25	to	40
Board, etc	280	to	400
Total	$528		$670

4.—Third Year.

Fees of the School	$200		$200
Text Books	20	to	30
Drawing Materials	5	to	7
Apparatus	25	to	40
Diploma	5	to	5
Board, etc	280	to	400
Total	$535		$682

FREE STUDENTS.

Whenever it appears to the satisfaction of the President and Treasurer of the College, that a student, who is of good moral character and industrious habits, desires to pursue the studies of the School of Mines, but is unable to pay the usual fees for tuition, he may be admitted without charge; or in case he shall so elect, may give his note for the amount, payable at his convenience, after he leaves the School. This relieves the student from the payment of the fee of two hundred dollars per annum for tuition.

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Le Roy, A.—L' Université de Liége depuis sa fondation.
Memoire de la Soc. Royale des Sciences de Liége. First series, 21 vols.; second series, 2 vols.
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From A. C. CANFIELD.

Annual Report of the State Geologist of N. J.

From A. R. WHITNEY, Esq.

Whitney, A. R.—Conic Sections.

From Prof. T. EGLESTON.

Egleston, T.—Lectures on Mineralogy. Text and Plates.
Revue de Géologie pour 1868–9.

From ALBERT FOLKE.

Die Organization des Staatsbauwesens.
Das Staatsbudget und das Berdurfnitz.

From C. H. HITCHCOCK, State Geologist of New Hampshire.

Hitchcock, C.—Report on Geological Survey of N. H.

From Prof. C. A. JOY.

The Scientific American. 4 vols.

From B. S. Lyman.

Lyman, B. S.—Topography of the Punjab Oil Regions.

From H. A. Mott.

Catalogue of Colleges in the U. S. Pamphlet.

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" " " " " Maps.
" " Modern Scientific Investigation.
Lyell—Principles of Geology.

From Pierre de P. Ricketts, E M.

The Colliery Guardian. 1866, '67, '68. 3 vols.
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Bentham, G.—Address to the Linnean Society.

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Department of Agriculture Report, Washington, D. C.
Conn. Board of Agriculture Report.

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SCHEME OF LECTURES.

FIRST SESSION.

OCT. 7, 1872 - - - JAN. 24, 1873.

FOR PREPARATORY STUDENTS.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
9 to 10					
10 to 11	Mathematics, Prof. VAN AMRINGE.	Drawing.	Mathematics, Prof. VAN AMRINGE.	Chemistry, Prof. JOY.	Chemistry, Prof. JOY.
11 to 12	German, Prof. STENGEL.	Mathematics, Prof. VAN AMRINGE.	Physics. Prof. ROOD.	German, Prof. STENGEL.	Mathematics, Prof. VAN AMRINGE.
12 to 1	Chemistry, Prof. JOY.	French, Prof. LOISEAU.	German, Prof. STENGEL.	Physics, Prof. ROOD.	Physics, Prof. ROOD.
1 to 2	French, Prof. LOISEAU.	Drawing.	Drawing.	French, Prof. LOISEAU.	French, Prof. LOISEAU.
2 to 5	Drawing.	Drawing.	Drawing.	Drawing.	Drawing.

FOR FIRST YEAR STUDENTS.

9 to 10					
10 to 11	Chemistry, Prof. JOY.	Descriptive Geometry, Prof. VINTON.	Crystallography, Prof. EGLESTON.	Mathematics, Prof. VAN AMRINGE.	Descriptive Geometry, Prof. VINTON.
11 to 12	Qualitative Analysis, Prof. CHANDLER.	Botany, Prof. NEWBERRY.	Mathematics, Prof. VAN AMRINGE.	Zoology, Prof. NEWBERRY.	
12 to 1	Mathematics, Prof. VAN AMRINGE.	Crystallography, Prof. EGLESTON.	Chemistry, Prof. JOY.	Chemistry, Prof. JOY.	French, Prof. LOISEAU.
1 to 2	German, Prof. STENGEL.	French, Prof. LOISEAU.	German, Prof. STENGEL.	Qualitative Analysis, Prof. CHANDLER.	
2 to 5					

FOR SECOND YEAR STUDENTS.

9 to 10					
10 to 11	Applied Chemistry, Prof. CHANDLER.	Physics, Prof. ROOD.	Geology, Prof. NEWBERRY.	Physics, Prof. ROOD.	Metallurgy, Prof. EGLESTON.
11 to 12	Mechanics, Prof. PECK.	Metallurgy, Prof. EGLESTON.	Mineralogy, Prof. EGLESTON.	Civil Engineering, Prof. VINTON.	Mechanics, Prof. PECK.
12 to 1	German, Prof. STENGEL.	Civil Engineering, Prof. VINTON.	Applied Chemistry, Prof. CHANDLER.	Geology, Prof. NEWBERRY.	Mining Engineering, Prof. VINTON.
1 to 2	Quantitative Analysis, Prof. CHANDLER.	Mining Engineering, Prof. VINTON.			Mineralogy, Prof. EGLESTON.
2 to 5					

FOR THIRD YEAR STUDENTS.

9 to 10					
10 to 11	Applied Chemistry, Prof. CHANDLER.	Economic Geology, Prof. NEWBERRY.	Assaying. Prof. CHANDLER.	Machines, Prof. VINTON.	Metallurgy, Prof. EGLESTON.
11 to 12		Metallurgy, Prof. EGLESTON.	Economic Geology, Prof. NEWBERRY.	Civil Engineering, Prof. VINTON.	Machines. Prof. VINTON.
12 to 1		Civil Engineering, Prof. VINTON.	Applied Chemistry, Prof. CHANDLER.	Quantitative Analysis, Prof. CHANDLER.	Mining Engineering, Prof. VINTON.
1 to 2		Mining Engineering, Prof. VINTON.			
2 to 5					

☞ Hours not occupied by Lectures are devoted to Laboratory Practice in Chemical Analysis and Assaying under Professor Chandler, assisted by Mr. Julien, Dr. Bolton, Mr. Waller, and Mr. Ricketts; or to Drawing, under Professor Vinton, assisted by Mr. Pistor.

SCHEME OF LECTURES.

SECOND SESSION.

FEB. 13, - - MAY 30, 1873.

FOR PREPARATORY STUDENTS.

HOURS.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
9 to 10					
10 to 11	German, Prof. STENGEL.	German, Prof. STENGEL.	Mathematics, Prof. VAN AMRINGE.	Chemistry, Prof. JOY.	Chemistry, Prof. JOY.
11 to 12	Drawing.	Mathematics, Prof. VAN AMRINGE.	Drawing.	Mathematics, Prof. VAN AMRINGE.	Mathematics, Prof. VAN AMRINGE.
12 to 1	Mathematics, Prof. VAN AMRINGE.	Physics, Prof. ROOD.	German, Prof. STENGEL.	Physics, Prof. ROOD.	Physics. Prof. ROOD.
1 to 2	French, Prof. LOISEAU.	French, Prof. LOISEAU.	Chemistry, Prof. JOY.	French, Prof. LOISEAU.	French, Prof. LOISEAU.
2 to 5					

FOR FIRST YEAR STUDENTS.

9 to 10					
10 to 11	Blow-Pipe Analysis, Prof. EGLESTON.	Zoology, Prof. NEWBERRY.	Chemistry, Prof. JOY.	Mathematics, Prof. VAN AMRINGE.	Mathematics, Prof. VAN AMRINGE.
11 to 12	German, Prof. STENGEL.	Descriptive Geometry, Prof. VINTON.	Zoology, Prof. NEWBERRY.	Descriptive Geometry, Prof. VINTON.	Blow-Pipe Analysis, Prof. EGLESTON.
12 to 1	French, Prof. LOISEAU.	Chemistry, Prof. JOY.	Mathematics, Prof. VAN AMRINGE.	French, Prof. LOISEAU.	Chemistry, Prof. JOY.
1 to 2	Stoichiometry, Prof. CHANDLER.		German, Prof. STENGEL.		Qualitative Analysis, Prof. CHANDLER.
2 to 5					

FOR SECOND YEAR STUDENTS.

9 to 10					
10 to 11	Physics. Prof. ROOD.	Mechanics, Prof. PECK.	Geology, Prof. NEWBERRY.	Geology, Prof. NEWBERRY.	Metallurgy, Prof. EGLESTON.
11 to 12	Mechanics, Prof. PECK.	German, Prof. STENGEL.	Physics. Prof. ROOD.		Applied Chemistry, Prof. CHANDLER.
12 to 1	Metallurgy, Prof. EGLESTON.	Mining Engineering, Prof. VINTON.	Applied Chemistry, Prof. CHANDLER.	Mining Engineering, Prof. VINTON.	Quantitative Analysis, Prof. CHANDLER.
1 to 2	Mineralogy, Prof. EGLESTON.	Civil Engineering, Prof. VINTON.		Civil Engineering, Prof. VINTON.	Mineralogy, Prof. EGLESTON.
2 to 5					

FOR THIRD YEAR STUDENTS.

9 to 10					
10 to 11		Machines. Prof. VINTON.		Machines, Prof. VINTON.	Metallurgy, Prof. EGLESTON.
11 to 12		Economic Geology, Prof. NEWBERRY.		Economic Geology, Prof. NEWBERRY.	Applied Chemistry, Prof. CHANDLER.
12 to 1	Metallurgy, Prof. EGLESTON.	Mining Engineering, Prof. VINTON.	Applied Chemistry, Prof. CHANDLER.	Mining Engineering, Prof. VINTON.	
1 to 2		Civil Engineering, Prof. VINTON.		Civil Engineering, Prof. VINTON.	
2 to 5					

☞ Hours not occupied by Lectures are devoted to Laboratory Practice in Chemical Analysis and Assaying under Professor CHANDLER, assisted by Mr. JULIEN, Dr. BOLTON, Mr. WALLER, and Mr. RICKETTS; or to Drawing, under Professor VINTON, assisted by Mr. PISTOR.

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CHARLES A. JOY, PH. D. Professor of General Chemistry.	117 East 70th Street.
WILLIAM G. PECK, LL. D. Professor of Mechanics.	Greenwich, Conn.
J. HOWARD VAN AMRINGE, A. M. Professor of Mathematics.	165 West 46th Street.
OGDEN N. ROOD, A. M. Professor of Physics.	341 East 15th Street.
JOHN S. NEWBERRY, M. D., LL. D. Professor of Geology and Palæontology.	Columbia College.
FREDERICK STENGEL, A. M. Instructor in German.	122 Waverley Place.

NAMES.	RESIDENCES.
JULES E. LOISEAU, A. B., LL. B. Instructor in French.	23 East 33d Street.
ALEXIS A. JULIEN, A. M. Assistant in Analytical Chemistry.	Columbia College.
ELWYN WALLER, A. M., E. M., PH. D. Assistant in Analytical Chemistry.	33 West 15th Street.
FREDERICK A. CAIRNS, A. M. Assistant in Analytical Chemistry.	40 Grove Street.
PIERRE DE PEYSTER RICKETTS, E. M. Assistant in Assaying.	50 West 50th Street.
HENRY CARRINGTON BOLTON, A. M., PH. D. Assistant in Analytical Chemistry.	49 West 51st Street.
CHARLES ADAMS COLTON, E. M. Assistant in Mineralogy.	748 Fifth Street.
EDWARD JOHN HALLOCK, A. M. Assistant in General Chemistry.	30 East 128th Street.
WILLIAM HALSEY INGERSOLL, A. M., LL. B., E. M. Assistant in Mechanics and Astronomy.	105 East 21st Street.
JASPER T. GOODWIN, A. B. Assistant in Mathematics.	Columbia College.
GRACIE S. ROBERTS, E. M. Assistant in Mining Engineering and Drawing.	88 Union Avenue, Brooklyn.
FREDERIC R. HUTTON, A. M., E. M., C. E. Assistant in Civil and Mechanical Engineering.	47 East 9th Street.
JOHN HOLME MAGHEE, E. M. Assistant in Mineralogy.	Columbia College.
JOHN HENRY CASWELL, A. B. Assistant in Mineralogy.	370 Fifth Avenue.

NAMES.	RESIDENCES.
I. C. RUSSELL Assistant in Geology.	Columbia College.
JAMES S. C. WELLS, Ph. B. Assistant in Analytical Chemistry.	Hackensack, N. J.
EDWARD G. LOVE, A. M., Ph. B. Assistant in Analytical Chemistry.	104 East 25th Street.
MAGNUS C. IHLSENG, E. M Assistant in Physics.	Columbia College.
JOHN FRANCIS MEYER, LL. B. Registrar and Librarian.	41 Horatio Street.
ROBERT M. RICKETTS Assistant Registrar and Librarian.	Elizabeth, N. J.

BENNO KUHNKE Engineer.	Columbia College.
CHARLES RICHTER Janitor.	Columbia College.

STUDENTS.

FOURTH CLASS.

NAME.	RESIDENCE.	CITY ADDRESS.
Luiz de Souza Barros	S. Paulo, Brazil	621 Lexington Avenue.
James Thom Beard	57 St. James' Place, Brooklyn.	
Edward Behr	155 Harrison St., Brooklyn.	
Charles Ramsey Buckley, A. B.	112 Montague St., Brooklyn.	
Linus Bertram Cady	New York City	224 W. 38th Street.
A. Cass Canfield	New York City	24 W. 38th Street.
John Britton Cauldwell	New York City	39 W. 28th Street.
Henry Gilbert Clark	Rockland Lake, N. Y.	104 Greenwich Avenue.
Charles Edward Colby	Brooklyn, L. I.	25 Nassau Street.
Charles Louis Constant	Cincinnati, O.	141 E. 48th Street.
George Birdsall Cornell	New York City	46 W. 48th Street.
Frederick William Floyd	New York City	14 Van Nest Place.
William White Hance	Woodbridge, N. J.	7 E. 27th Street.
Frank Stuart Helleberg	Cincinnati, O.	139 E. 53d Street.
Walter Edwards Hildreth	Flushing, L. I.	52 Broadway.
Axel Olaf Ihlseng, B. S.	New York City	151 E. 33d Street.
William Kelley, A. B	New York City	9 W. 16th Street.
James Buckton Mackintosh	Liverpool, England.	55 Garden St., H'k'n, N. J.
Auguste Mathez	348 Henry St., Brooklyn.	
Theodore Melius	Newark, N. J.	537 Broadway.
John Glenvil Murphy	Middletown, Conn.	141 E. 48th Street.
Ralph Nichols	Nyack, N. Y.	
Dudley Hiram Norris	112 Lafayette Ave., Brooklyn.	
James Robert Priest	Monrovia, Liberia, West Africa.	102 Amity St.
William Helshaw Radford	New Rochelle, N. Y.	110 Broadway.
Sylvanus Albert Reed, A. B.	New York City	6 E. 53d Street.
Edward Eugene Sage	Spuyten Duyvil, N. Y.	
Roland Mulville Smythe	539 Henry St., Brooklyn.	
Arthur Thacher	New York City	108 E. 36th Street.
Robert Ward Van Boskerck	Hackensack, N. J.	314 Madison Avenue.
Cornelius Read Waterbury	New York City	250 W. 55th Street.

Fourth Class...31.

THIRD CLASS.

NAME.	RESIDENCE.	CITY ADDRESS.
William James Adams, A. B.	New York City	13 W. 20th Street.
Marcus Benjamin	New York City	116 E. 70th Street.
Charles Edward Blydenburg	Smith Town, L. I.	22 W. 22d Street.
Robert Elmer Booraem	Grove St., cor. 1st, Jersey City, N. J.	
Charles Spencer Boyd	313 Adelphi St., Brooklyn.	
Willard Parker Butler	New York City	45 Exchange Place.
Stephen Berry Culver, A. B.	Sandy Hill, N. Y.	131 E. 17th Street.
John Woodbridge Davis	New York City	175 E. 82d Street.
Walter B. Devereux, A. B.	Deposit, N. Y.	335 E. 50th Street.
Orrien Pinkerton Downing.	477 Bergen St., Brooklyn.	
Isaac Wyman Drummond	New York City	274 W. 11th Street.
Walter Graeme Elliott	New York City	120 W. 42d Street.
Charles Frederick Fahs	York, Pa.	
Anton Fernekes	Milwaukee, Wis.	107 W. 41st Street.
Harry Leopold Haas	New York City	49 W. 39th Street.
Yothinosuke Hasegawa	Tokio, Japan	62 W. 12th Street.
Henry Albert Hodges	New York City	135 Lexington Avenue.
Edward Henry Holden	Morrisania, N. Y.	
William Hollis	195 Amity St., Brooklyn.	
Elias Mattison Johnson	Spuyten Duyvil, N. Y.	
Gilbert Henry Johnson	Spuyten Duyvil, N. Y.	
José Nabõr Pacheco Jordão	Ytu Sãs Paulo, Brazil.	108 E. 46th Street.
Benjamin Bowden Lawrence	Riverside, Conn.	139 E. 15th Street.
Frank Lyman, A. B	Brooklyn, N.Y.,	care A. A. Low & Bros., N.Y. City.
Nawokichi Matsui	Tokei, Japan	3 W. 30th Street.
George Barrow Morewood	New York City	45 W. 37th Street.
Gouverneur William Morris	New York City	39 W. 14th Street.
Charles Edward Munsell	New York City	35 W. 47th Street.
Harry Morgan Murphy	16 South Street, Newark, N. J.	
Kingo Nambu	Tokio, Japan	117 E. 31st Street.
Spencer Baird Newberry	Cleveland, Ohio	141 E. 48th Street.
James Atkins Noyes.	155 Remsen Street, Brooklyn, N. Y.	
Owen Frederick Olmstead	New York City	209 W. 46th Street.
Frederick Nash Owen	Nyack, N. Y.	71 Wall Street.
Cortland Edward Palmer	New York City	31 E. 22d Street.
Richard Alexander Parker	New York City	220 W. 21st Street.
Vicente Felix Pazos	Lima, Peru	63 Pine Street.
Nelson William Perry	Cincinnati, O.	620 Lexington Avenue.
Willard Ide Pierce	New York City	5 Pine Street.
Walter Prosser	406 Stuyvesant Ave., Brooklyn.	
William Rupp	New York City	13 Avenue A.

NAME.	RESIDENCE.	CITY ADDRESS.
Richard Henesee Tiernan	Galveston, Texas	Tremont, N. Y.
George Harry Warren	Paris, France	22 W. 23d Street.
Bailey Willis	New York City	42 W. 19th Street.

Third Class ....44.

SECOND CLASS.

NAME.	RESIDENCE.	CITY ADDRESS.
Otto Paul Amend	New York City	320 E. 19th Street.
Frank Emerson Baldwin	6 Middagh St., Brooklyn.	
Edward Chapman Barnard	New York City	427 Fifth Avenue.
Alfred S. Bates, Jr	Scarsdale, N. Y.	10 E. 41st Street.
Robert Bolton	Pelham, N. Y.	
Charles Pierre Bonnett	New York City	6 E. 12th Street.
George Charles Brinckerhoff	Matanzas, Cuba	93 Madison Avenue.
Nathaniel Lord Britton	New Dorp, Staten Island.	
Hiram Charles Calkins	New York City	124 E. 80th Street.
Leo George Cloud, A. B	Newport, Campbell Co., Ky.	141 E. 48th Street.
Washington Content	New York City	157 W. 46th Street.
Henry Clay Cornwall	Garden City, L. I.	
Alexander Ramsey Cushman	New York City	128 E. 16th Street.
Louis Philip de Luze, Jr	Pelham, N. Y.	48 Pine Street.
John Henry Drevenstedt	New York City	1294 Fourth Ave.
George Spencer Eastwick	New York City	68 W. 37th Street.
Cornelius Simonson Egbert	Clifton, N. Y.	
George Pierre Erhard	New York City	67 E. 10th Street.
Charles Joel Fisk	New York City	7 E. 38th Street.
Henry Martyn Gibson	Box 628, Yonkers, N. Y.	
David Rhoades Godwin	58 Bedford Ave., Brooklyn.	65 Wall Street.
Louis Francis Haffen, A. B.	New York City,	cor. Courtlandt Ave. and 152d St.
Graeme Munroe Hammond	New York City	43 W. 54th Street.
Charles Sumner Harker	New York City	54 E. 49th Street.
Nathaniel Hathaway	297 Henry St., Brooklyn, L. I.	
Herman Hollerith	New York City	161 E. 61st Street.
Charles Arthur Hollick	New Brighton, S. I.	P. O. Box 3606, N. Y.
Solomon Richard Jacobs	New York City	70 W. 48th Street.

NAME.	RESIDENCE.	CITY ADDRESS.
Isaac Bradley Johnson	Spuyten Duyvil, N. Y.	
Robert Andrew Johnston	Scarsdale, N. Y.	
Rudolph Herman Kissel	New Brighton, Staten Island.	P. O. Box 1105, N. Y.
Edwart Cabet Koch	New York City	160 E. 56th Street.
Thomas Haight Leggett, Jr.	Flushing, Queens Co., L. I.,	219 W. 38th Street.
Edgar Henry Loyhed	Fairbault, Rice Co., Minn.	117 E. 31st Street.
Edward Ludlow	Oakdale, N. Y.	47 E. 23d Street.
Charles Wells Marsh	319 Adelphi St., Brooklyn, L. I.	
Edward Ward Martin	Norfolk, Va.	47 W. 55th Street.
Frederick Ferdinand Martinez, Jr.,	New York City	1227 Broadway.
Theophilus Smith Mathis	197 Macdonough St., Brooklyn.	
Joseph Godley Mattison	Hastings-on-Hudson, N. Y.	91 Gold Street.
Ralph Edward Mayer	New York City	218 E. 112th Street.
Edward Austen McCulloh	Glencoe, Md.	P. O. Box 2346, N. Y.
Joseph McNulty	26 Sands Street, Brooklyn.	
Hubert John Merwin	668 Hancock St., Brooklyn.	
George Fanshawe Milliken	New York City	163 Madison Avenue.
Otis Mortimer Munroe	New York City	102 E. 45th Street.
Joseph William Knight Neftel	New York City	16 E. 48th Street.
James Nesmith	Brooklyn, L. I	28 South Street.
Harrie Gates Newton	New York City	128 W. 43d Street.
Charles Milton Noble	Anniston, Alabama	238 E. 49th Street.
William Winterton Owens, Jr.	New York City	553 Fifth Avenue.
Herbert Parsons	Flushing, L. I.	
William Bell Stephen Reed	857 Sackett Street, Brooklyn, L. I.	
Henry Gratacap Ridabock	New York City	42 W. 29th Street.
Samuel Edward Rusk	Tannersville, Green Co., N.Y.	84 St. James Pl., B'k'n.
Francis Morris Rutherfurd	New York City	244 E. 13th Street.
Ferdinand Ruttman, Jr.	Plainfield, N. J.	Box 121, N. Y.
William Woodcock Sharp	438 Grand Ave., Brooklyn, L. I.	
Gardner Hutchinson Sheldon	123 Montague St., Brooklyn.	
Henry Fowler Starr	91 Mt. Pleasant Ave., Newark, N. J.	141 E. 48th St.
Francis Barretto Stewart	New York City.	3 W. 129th Street.
George Cameron Stone	New York City	25 W. 32d Street.
William Strieby	253 Broad Street, Newark, N. J.	
William Mayberry Strobridge	Cincinnati, O.	117 E. 31st Street.
John Richard Suydam, Jr.	Sayville, L. I.	43 E. 22d Street.
Alexander Robinson Taylor	Newburgh, Orange Co., N.Y.	P. O. Box 101, N.Y.
Wibray James Thompson	Chicago, Ill.	143 E. 29th Street.
Theodore Tonnelé	Washington Heights, N.Y.	
Elsey McHenry Train	New York City	317 E. 17th Street.
Edward Howe Wales	New York City	520 Fifth Avenue.
Granville Whittlesey Williams	388 Clinton St., Brooklyn.	
Preston King Yates	Canajoharie, Montgomery Co., N.Y.	687 Lexington Ave.

Second Class .... 71.

FIRST CLASS.

NAME.	RESIDENCE.	CITY ADDRESS.
David Banks	New York City	33 W. 39th Street.
Benedict Andros Barrows	St. Joseph, Buchanan Co., Mo.	85 Seventh Ave.
William A. Bartlett	New York City	43 W. 11th Street.
Alfred Lockwood Beebe	New York City	22 W. 26th Street.
Frank Parkinson Benjamin	New York City	31 W. 19th Street.
Frederick Denison Browning	Perryville	81 Carleton Avenue, Brooklyn.
John Henry Brower Browning	New York City	122 Second Avenue.
William Frederick Brugman	New York City	327 E. 57th Street.
Nathaniel Butler	New York City	58 E. 128th Street.
William Stewart Church	Riga, Monroe Co., N.Y.	21 Christopher Street.
Edwin Perry Clark	340 Clinton St., Brooklyn.	
Frederick Lane Crosby	New York City	165 Madison Avenue.
Alfred Eugene Crow	New York City	17 W. 52d Street.
Edward Moulton Davis.	Mount Vernon, Westchester Co., N. Y.	
Jesse Dovalé	Inwood, N. Y.	P. O. Box 3577, N. Y.
William Elliott	New York City	302 E. 15th Street.
Augustus Schermerhorn Emmett	New York City	30 W. 49th Street.
Godfrey Engel	72 First Street, Williamsburgh, L. I.	
Louis George Engel	91 Second Place, Brooklyn.	
Robert Otto Francke	New York City	2 W. 50th Street.
Edward Augustus Gillespie	New York City	11 E. 32d Street.
William Updike Greene	316 Clinton Avenue, Brooklyn.	23 Liberty Street.
James Leab Greenleaf	New York City	23 W. 12th Street.
Albert Peter Hallock	Peekskill, Westchester Co., N.Y.	30 E. 128th St.
Frank J. Heal	West New Brighton, Staten Island.	5 & 7 John St.
Henry Harman Hendricks	New York City	512 Fifth Avenue.
Louis M. Hooper	New York City	Gen'l Theol. Sem., W. 20th St.
Theodore Hopke	Hastings, N. Y.	
Edward Henry Hudson	New York City	308 W. 22d Street.
Frank Gerhard Janssen	New Brighton, Staten Island.	68 Broad Street.
Henry Elijah Knox, Jr.	New York City	20 E. 69th Street.
Wheaton Bradish Kunhardt	New Brighton, Staten Island.	
Thomas Felix Macaulay	New York City	133 W. 28th Street.
Carl August Meissner	New Dorp, Staten Island.	48 Beaver Street.
James Haviland Merritt	253 Grand Avenue, Brooklyn.	345 Broadway.
Antonio Esteban Mesa	Sagua la Grande, Cuba.	201 E. 61st Street.
Edward Henriques Myers	New York City	103 E. 37th Street.
Juan Adalberto Navarro	New York City	251 W. 44th Street.
Emanuel Nordheim	New York City	1012 Second Avenue.
Andrew McClean Parker	Plainfield, N. J.	37 William Street.
John Randolph Parks	76 South 10th Street, Brooklyn, E. D.	
Frederick Potts, Jr.	Pittstown, N. J.	110 Broadway.

NAME.	RESIDENCE.	CITY ADDRESS.
Edgar Richards	New York City	113 E. 30th Street.
John Nunns Roach	New York City	966 Fifth Avenue.
Henry Alvord Robinson	New York City	5 E. 65th Street.
William Fridge Murdoch Rodgers	New London, Conn.	Mott Haven.
Frederick William Schmadeke	New York City	388 E. 4th Street.
George Singer, Jr.	Wilkinsburgh, Pa.	Sturtevant House.
George Harton Singer	Alleghany City, Pa.	
Arden William Smith	St. Louis, Mo.	113 E. 12th Street.
Halsey Kellogg Smith	New York City	62 E. 128th Street.
Maxwell Smith	New York City	414 Madison Avenue.
Michael Henry Smith	Williamsburgh, L. I.	508 E. 13th Street.
Chandler Dannat Starr	New York City	155 Lexington Avenue.
Frederic Anson Taylor	90 Joralemon Street, Brooklyn.	
William Alexander Taylor	Arcola, N. J.	17 Wall Street.
Charles Herbert Torrey	New York City	165 E. 49th Street.
Joseph Walker, Jr.	New York City	289 Fifth Avenue.
Herbert Allen Wheeler	New Brighton, Staten Island.	113 Wall Street.
Charles Fred. Wiebusch	New York City	134 W. 21st Street.
Emanuel Yturri	San Antonio, Texas	108 E. 74th Street.

First Class .... 61.

SPECIAL STUDENTS.

NAME.	RESIDENCE.	CITY ADDRESS.
Walter Lee Brown	Evanston, Ill.	72 W. 35th Street.
Hamilton Young Castner	202 Union St., Brooklyn, L. I.	76 Centre Street.
William Baldwin Fitts	Irvington, N. Y.	106 Reade Street.
Nicholas Audinet Gibert	New York City.	298 Fifth Avenue.
Frank Harper, Jr.	New York City	234 Fifth Avenue.
Francis Morris Rodgers	Throg's Neck, N. Y.	51 New Street.
William John Sutton	Walkerton, Ontario, Canada.	219 E. 53d Street.
Frederick William Taylor	New York City	275 Madison Avenue.
W. L. Ward	Port Chester, N. Y.	

Special Students .... 9.

VOLUNTARY STUDENTS IN PRACTICAL ASTRONOMY.

NAME.	RESIDENCE.
Luiz de Souza Barros	S. Paulo, Brazil.
Robert Elmer Booraem	Jersey City, N. J.
Willard Parker Butler	New York City.
John Woodbridge Davis	New York City.
Isaac Wyman Drummond	New York City.
Walter Graeme Elliott	New York City.
Anton Fernekes	Milwaukee, Wis.
Harry Leopold Haas	New York City.
Yothinosuke Hasegawa	Tokio, Japan.
Jose Nabõr Pacheco Jordaõ	Ytu Sãs Paulo, Brazil.
Owen Frederick Olmsted	New York City.
Willard Ide Pierce	New York City.
Walter Prosser	Brooklyn, N. Y.

POST GRADUATES.

NAME.	RESIDENCE.	CITY ADDRESS.
Peter Townsend Austen, Ph.B.	Box 130, Stapleton P. O., Staten Island.	
John Holme Maghee, A. M., C. E.,	New York City	16 E. 54th Street.
John Cooper Randolph, A. M., E. M.,	New York City.	35 Broadway.

Post Graduates	3.

SUMMARY.

Fourth Class	31
Third Class	44
Second Class	71
First Class	61
Special Students	9
Post Graduate Students	3
Total	219

REQUIREMENTS FOR ADMISSION.

THE FIRST CLASS.*

Candidates for the first class must be seventeen years of age, and must pass a satisfactory examination in arithmetic, including the metric system of weights, measures and moneys ; in algebra, on the first five chapters of Peck's Manual of Algebra ; and in geometry, on the first five books of Davies' Legendre.

THE SECOND CLASS.

Candidates for admission to the second class must not be less than eighteen years of age.

They must pass a satisfactory examination in algebra, geometry, and plane, analytical and spherical trigonometry, physics, and general chemistry ; and will be required to execute such portion of the first year drawing as may be assigned them.

Graduates and students of colleges and schools of science who shall have completed so much of the course of study as shall be equivalent to the requirements for admission may be admitted to the second class without examination, on presenting diplomas or certificates of good standing and honorable dismissal *satisfactory to the examining officers.*

Candidates for advanced standing are examined in all the studies previously pursued by the classes which they propose to enter.

The regular examinations for admission are held annually on the Friday before Commencement (June 22, 1877), and on the Friday preceding the first Monday in October (September 28, 1877). Candidates will, however, be examined during the session.

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* The following resolutions were adopted by the Board of Trustees, June 5, 1876 :

"*Resolved*, That the course of study in the School of Mines shall continue through four years of time, the year's courses to be called respectively the First, Second, Third, and Fourth classes; and that the use of the term 'Preparatory Class' be discontinued, that class being hereafter known as the First Class."

"*Resolved*, That after the first day of June, 1878, a certain proficience in the French and German languages (to be hereafter defined and advertised) shall be required for entrance to the School of Mines, such proficience to be graduated according to the classes the candidate may propose to enter."

SPECIAL COURSES OF STUDY.

Candidates for admission to special courses must not be less than eighteen years of age.

Students may be admitted to special courses of study or practice in Chemistry, Assaying, Geology, or Natural History, if it shall appear to the professors in those departments that they are qualified to pursue such studies with profit.

Applicants for admission to special courses in other departments will not be received into the School except by vote of the Faculty, nor without good reason shown why they should not take a regular course. Every such applicant, before being so admitted, must pass such examinations as are required of regular students for admission to the course proposed.

EXPENSES.

The fee for the full course is two hundred dollars per annum.

Special students in Chemistry pay two hundred dollars per annum.

These fees are payable one-half on the first day of each session.

Special students in Assaying are admitted for two months for a fee of fifty dollars in advance.

The fees for single courses of lectures vary from ten dollars to thirty dollars.

A charge of five dollars is made for the diploma.

APPARATUS SUPPLIES.

I. Students may purchase apparatus of any of the dealers in the city.

II. To save inconvenience and expense to the students, and secure a proper selection, the School undertakes, at considerable trouble and expense, to lend apparatus on the following conditions :

1. Each student must make a deposit with the Registrar, which deposit will be credited to him on the ledger. This deposit will be $25 for Second Year students, $40 for Third Year students, and $50 for Fourth Year students.

2. He will be entitled, on presenting his receipt at the Supply Room, to draw the regular set of apparatus for qualitative or quantitative analysis, or for assaying, according to his deposit, and from time to time to obtain ordinary articles which he may need, and these will be charged to him. At the end of the session he will be credited with those articles which he returns in good order, while the value of those which he has injured or broken will be deducted from his deposit.

3. Apparatus may be purchased at any time for cash.

4. Students must assure themselves of the satisfactory condition of every article received *before leaving the Supply Room.* Any article may be immediately exchanged on a reasonable objection to its condition. No apparatus can be *afterwards* returned for exchange for any reason, whatever its deficiency in quantity or quality.

5. At the end of the second term, or on leaving the School, the apparatus may be retained by the student; but, in that case, must be removed from the School, and the account settled with the Registrar. If returned to the Supply Room, only those articles will be received which are in a sufficiently good condition to be re-issued, subject to a deduction (in the credit account of the student) of from about 20 to 50 per cent. of the prices on the list, according to the average wear and tear to which they are subjected in use.

III. Students are warned that much of the apparatus sold by dealers, especially glassware, is of cheap but inferior American manufacture, and often of a different pattern from the imported articles. Such inferior apparatus can neither be of proper service to the student in his work, nor can it be returned to the Supply Room.

IV. The keys and locks charged on the lists are furnished by the assistants in charge of the laboratories. Keys must be returned to the assistant at the end of the second term.

V. The Supply Room will be open for issuing supplies every day at convenient hours.

VI. No charge is made for ordinary chemicals.

FREE STUDENTS.

Whenever it appears to the satisfaction of the President and the Treasurer of the College that a student, who is of good moral character and industrious habits, desires to pursue the studies of the School, but is unable to pay the usual fees for tuition, he may be admitted without charge. This relieves the student from the payment of the fee of two hundred dollars per annum for tuition.

Graduates of the School have the privilege of attending the lectures of the School without charge for tuition.

NECESSARY EXPENSES OF A STUDENT ATTENDING THE SCHOOL OF MINES.

1.—First Class.

	MINIMUM.	MAXIMUM.
Fees of the School	$200	$200
Text Books	15	15
Drawing Instruments, etc	15 to	25
Board, washing, fire, and light (about 38 weeks)	300 to	450
Total	$530	$690

2.—Second Class.

	MINIMUM.	MAXIMUM.
Fees of the School	$200	$200
Text Books	30 to	40
Drawing Materials	15 to	25
Apparatus	30 to	50
Board, etc.	300 to	450
Total	$575	$765

3.—Third Class.

	MINIMUM.	MAXIMUM.
Fees of the School	$200	$200
Text Books	30 to	40
Drawing Materials	5 to	10
Apparatus	40 to	60
Board, etc	300 to	450
Total	$575	$760

4.—Fourth Class.

	MINIMUM.	MAXIMUM.
Fees of the School	$200	$200
Text Books	20 to	30
Drawing Materials	5 to	10
Apparatus	40 to	60
Diploma	5	5
Board, etc	300 to	450
Total	$570	$755

GENERAL STATEMENT.

The School of Mines was established in 1864 for the purpose of furnishing to students the means of acquiring a thorough knowledge of those branches of science which form the basis of the industrial pursuits that are to play the most important part in the development of the resources of our country.

The system of instruction includes five parallel courses of study, viz.:

I. Civil Engineering.
II. Mining Engineering.
III. Metallurgy.
IV. Geology and Natural History.
V. Analytical and Applied Chemistry.

The plan of instruction includes lectures and recitations in the several departments of study ; practice in the chemical, mineralogical, blow-pipe and metallurgical laboratories ; projects, estimates, and drawings for the establishment of mines, and for the construction of metallurgical and chemical works; reports on mines, industrial establishments, and field geology.

Instruction is given in the following subjects :

Analytical Geometry,
Calculus,
Descriptive Geometry,
Mechanics,
Strength of Materials,
Civil Engineering,
Mining Engineering,
Machines,
Civil and Mine Machinery,
Mine Surveying,
Physics,
Inorganic Chemistry,
Organic Chemistry,
Stoichiometry,
Analytical Chemistry,
Applied Chemistry,
Metallurgy,
Assaying,
Blowpipe Analysis,
Crystallography,
Mineralogy,
Geology,
Palæontology,
Botany,
Zoology,
Shades, Shadows, and Perspective,
Stone Cutting,
Machine, Map, and Topographical Drawing,
Sketching, in Pencil and Colors,
French,
German.

The course of instruction occupies four years. Those who complete it receive the degree of Engineer of Mines, Civil Engineer, or Bachelor of Philosophy.

There is an advanced course for graduates of the School, for the degree of Doctor of Philosophy.

The year is divided into two sessions. The first commences on the first Monday in October ; the second on the second or third Thursday of February. The lectures close on the last Friday in May, or the first Friday in June, and are followed by an examination on the studies of the year.

The method of instruction is such that every pupil may acquire a thorough theoretical knowledge of each branch, of which he is required to give evidence, at the close of the session, by written and oral examinations. At the commencement of the following year he is required to show, from reports of works visited, that he understands not only the theoretical principles of the subjects treated, but also their practical application—a point that is insisted on with great rigor.

SYNOPSIS OF STUDIES.

The studies in the First and Second Years are alike in the five courses.

FIRST YEAR.

Geometry, Algebra, Trigonometry, and Mensuration.
Physics.
Chemistry, Inorganic and Organic—Lectures, experiments and recitations.
French.
German.
Drawing—Use of Instruments ; lettering, pen and colored topography ; right line and brush grading ; right line, colored and graded machine and architectural drawing.

SECOND YEAR.

Analytical Geometry and Calculus.
Descriptive Geometry—Plane and spherical projections; warped surfaces—Lectures and exercises.
Shades, Shadows and Perspective—Lectures and exercises.
Stone Cutting.
Chemistry, Inorganic and Organic—Lectures, experiments and recitations.
Stoichiometry—Lectures and blackboard exercises.
Qualitative Analysis—Lectures and laboratory practice.
Crystallography—Lectures and practical exercises.
Blowpipe Analysis, Qualitative—Lectures and laboratory practice.
Botany—Recent and fossil.
Zoology—Recent and fossil.
French.
German.
Drawing—Use of instruments ; colored, architectural, and problems in shade, shadows, perspective and stone cutting.

SUMMER VACATION.

MEMOIR.

I.—COURSE IN CIVIL ENGINEERING.

THIRD YEAR.

Mechanics—Mechanics of solids ; mechanics of liquids ; mechanics of gases.
Civil Engineering.
Strength of Materials.
Geodesy—Surveying with chain, with compass, with angular instruments, and with plane table ; practical trigonometry, levelling, hydrography, geodesic operations for the construction of maps.
Quantitative Analysis—Lectures and laboratory practice.
Metallurgy—General processes, fuel, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic and dynamic.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
Physics—Undulatory theory of light, electro-statics, and mechanical theory of heat.
Drawing—Machines, furnaces and other constructions.

SUMMER VACATION.

MEMOIR.

FOURTH YEAR.

Mechanics applied to Engineering—Problems of hydraulics and pneumatics.
Constructions—Machines, turbines and other water-wheels, air and steam engines, etc.
Economic Geology—Theory of mineral veins ; ores ; deposits and distribution of metals, iron, copper, lead, etc. ; character, history, uses and distribution of coal, lignite, peat, petroleum, salts, clays, building and ornamental stones, fertilizers, etc.
Drawing—Project drawings.
Project—Dissertation and drawings, embracing the solution of some problem in engineering assigned by the Faculty of the School.

DEGREE OF CIVIL ENGINEER.

II.—COURSE IN MINING ENGINEERING.

THIRD YEAR.

Mechanics—Mechanics of solids ; mechanics of liquids ; mechanics of gases.
Mining Engineering—Surveying and mining operations.
Strength of Materials.
Quantitative Analysis—Lectures and laboratory practice.
Blowpipe Analysis, Quantitative—Lectures and laboratory practice.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic and dynamic.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
Physics—Undulatory theory of light, electro-statics, and mechanical theory of heat.
Drawing—Machines, plans, etc.

SUMMER VACATION.

MEMOIR.

FOURTH YEAR.

Mining Engineering—Mining machines.
Assaying—Lectures and laboratory practice ; ores of lead, silver, gold, tin, antimony, copper, nickel, cobalt and mercury ; gold and silver bullion.
Economic Geology—Theory of mineral veins ; ores ; deposits and distribution of metals, iron, copper, lead, etc. ; character, history, uses and distribution of coal, lignite, peat, petroleum, salt, clay, building and ornamental stones, fertilizers, etc.
Metallurgy—Lectures on copper, lead, silver, gold, zinc, etc.
Quantitative Analysis—Laboratory practice.
Drawing—Project drawings.
Project—Dissertation and drawings, embracing the solution of some mechanical, mining or metallurgical problem, assigned by the Faculty of the School.

DEGREE OF MINING ENGINEER.

III.—COURSE IN METALLURGY.

THIRD YEAR.

Mechanics.
Quantitative Analysis—Lectures and laboratory practice.
Blowpipe Analysis, Quantitative—Lectures and laboratory practice.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic and dynamic.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
Drawing—Furnaces, machines, etc.

SUMMER VACATION.

MEMOIR.

FOURTH YEAR.

Assaying—Lectures and laboratory practice; ores of lead, silver, gold, tin, antimony, copper, nickel, cobalt and mercury; and gold and silver bullion.
Economic Geology—Theory of mineral veins; ores; deposits and distribution of metals, iron, copper, lead, etc.; character, history, uses and distribution of coal, lignite, peat, petroleum, salt, clays, building and ornamental stones, fertilizers, etc.
Metallurgy—Lectures on copper, lead, silver, gold, zinc, etc.
Quantitative Analysis—Laboratory practice.
Lithology—The character and genesis of rock masses; microscopic and chemical study of rocks.
Drawing—Project drawings.
Project—Dissertation and drawings, embracing the solution of a metallurgical problem assigned by the Faculty of the School.

DEGREE OF BACHELOR OF PHILOSOPHY.

IV.—COURSE IN GEOLOGY AND NATURAL HISTORY.

THIRD YEAR.

Quantitative Analysis—Lectures and laboratory practice.
Blowpipe Analysis, Quantitative—Lectures and laboratory practice.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic and dynamic.
Drawing—Making sections, sketching, and drawing fossils and other natural history objects.

SUMMER VACATION.

MEMOIR.

FOURTH YEAR.

Economic Geology—Theory of mineral veins ; ores, deposits and distribution ; metals, iron, copper, lead, etc. ; character, history, uses, and distribution of coal, lignite, peat, petroleum, salt, clays, building and ornamental stones, fertilizers, etc.
Lithology—The character and genesis of rock masses ; microscopic and chemical study of rocks.
Palæontology—Systematic review of recent and fossil forms of life, animal and vegetable.
Metallurgy.
Drawing—Project drawings.
Dissertation, embracing results of observation, and study of some subject assigned by the Faculty of the School.

DEGREE OF BACHELOR OF PHILOSOPHY.

V.—COURSE IN ANALYTICAL AND APPLIED CHEMISTRY.

THIRD YEAR.

Applied Chemistry—Lectures on chemical manufactures; acids, alkalies, and salts; glass, porcelain, pottery, limes, mortars and cements.
Quantitative Analysis—Lectures and laboratory practice.
Blowpipe Analysis, Quantitative—Lectures and laboratory practice.
Mineralogy—Determinative mineralogy, and blowpipe examination of minerals.
Metallurgy—General processes, fuels, furnaces, iron and steel.
Geology—Lithological, cosmical, physiographic, historic and dynamic.
Drawing—Furnaces, machines, apparatus, etc.

SUMMER VACATION.

MEMOIR.

FOURTH YEAR.

Applied Chemistry—(1) Fuel and its Applications; (2) Artificial Illumination: candles, oils, lamps, petroleum, gas and its products; (3) Food and Drink: water, milk, cereals, starch, bread, meats, tea, coffee, sugar, fermentation, wine, beer, spirits, vinegar, preservation of food, tobacco, etc.; (4) Clothing: textile fabrics, bleaching, dyeing, calico printing, paper, tannin, glue, india-rubber, gutta-percha, etc.; (5) Artificial Fertilizers: guano, superphosphates, poudrettes, etc.; (6) Disinfectants, Antiseptics, Preservation of Wood, etc.
Quantitative Analysis—Laboratory practice.
Assaying—Lectures and laboratory practice; ores of lead, silver, gold, tin, antimony, copper, nickel, cobalt, mercury; and gold and silver bullion.
Economic Geology—Theory of mineral veins; deposits of metallic ores: iron, copper, etc.; coal, peat, lignite, petroleum, salt, clay, building and ornamental stones, fertilizers, etc.
Metallurgy—Lectures on copper, lead, silver, gold, zinc, mercury, etc.
Drawing—Project drawings.
Dissertation, embracing results of observations, and experimental study on some chemical subject assigned by the Faculty of the School.

DEGREE OF BACHELOR OF PHILOSOPHY.

DEPARTMENTS OF INSTRUCTION.

MATHEMATICS.

FIRST YEAR.

First Session.

GEOMETRY—Plane, Volumetric and Spherical.
ALGEBRA—Through Equations of the Second Degree.

Second Session.

ALGEBRA—So far as to include the General Theory of Equations.
TRIGONOMETRY—Plane, Analytical and Spherical.
MENSURATION of Surfaces and of Volumes.

SECOND YEAR.

First Session.

ANALYTICAL GEOMETRY of two and three dimensions.

Second Session.

DIFFERENTIAL AND INTEGRAL CALCULUS.

PHYSICS.

The students in the first year are occupied during the first term with the subject of Heat, including the Steam-Engine, while the second term is employed in the study of Voltaic Electricity, Magnetism and Electro-magnetism. The courses are fully illustrated by appropriate experiments, and practical problems are occasionally proposed for solution.

During the third year, courses of lectures are delivered on the laws of Electro-statics, on the Mechanical Theory of Heat, on Mathematical Optics, and on the Undulatory Theory of Light. Portions of these courses are accompanied by experimental demonstrations.

The cabinet of Physical Apparatus will rank with the best on this continent, and extensive additions are made to it each year.

MECHANICS.

This subject is taught during the third year. The course of instruction embraces the following subjects:

Representation and measurement of forces; composition, resolution, and equilibrium of forces; principles of moments and virtual moments; theory of parallel forces; application to centre of gravity; stability.

Elementary machines; friction, resistance to rolling, stiffness of cords, atmospheric resistance.

General equations of motion; rectilineal, uniform, and uniformly varied motion; curvilinear motion, free and constrained; centrifugal force; application to the governor; vibratory motion; application to the pendulum; motions of translation and rotation; moment of inertia, principal axes and ellipsoid of inertia; laws of impact; centre of percussion; general theorem of work; accumulation of work; application to fly wheel.

Mechanics of fluids; pressure due to weight; equal transmission of pressures; application to hydraulic press; buoyancy and flotation; application to specific gravity.

Tension and elasticity of gases and vapors; laws of variation; application to pumps and siphons; investigation of the barometer formula; motion of liquids in pipes and open channels; living force of fluids; application to hydraulic ram; mechanics of capillarity.

PRACTICAL ASTRONOMY.—Students of the third and fourth classes may be admitted to the course of practical astronomy in the observatory, which will include the theory and use of the transit instrument and sextant, and the determination of geographical position. Instruction in this branch is given by the assistant in the observatory.

DRAWING AND GRAPHICS.

During the first session of the first year the student is taught the use of drawing instruments, and then to execute topographical maps. He is first instructed in the use of the pen to delineate lines of level, shaded with lines of declivity, and completed with the conventional signs of different features, such as water, forests, marshes, cultivated grounds, out-crops of veins, etc.; subsequently he is taught to represent the same with the application of the conventional signs and colors used by our government and civil engineers. During the second session the course of instruction includes right line and brush grading; right line, colored and graded machine and architectural drawing.

During the second year Descriptive Geometry is taught. The course of instruction includes the study of Davies' treatise on this subject, with lectures and blackboard exercises, illustrated by Olivier's and other models, exposing the more difficult problems of intersections and the generation of warped surfaces.

The instruction in drawing includes the use of mathematical instruments in colored architectural drawings to an enlarged scale.

During the second session Graphics are taught, including the study of Davies' Shades and Shadows and Perspective, and Mahan's Stone-Cutting, with explanatory lectures, the exhibition of models, and the solution of various problems of shades and shadows.

The course of drawing includes instruction and practice in the use of instruments, the pen and brush, with India-ink, in drawing mathematical forms in projection and perspective, shading them, casting their shadows, and washing them. This is followed by an application of the principles learned to the execution of a drawing of a machine, or the section of a furnace, wherein the shadows are accurately calculated and washed, and the drawing is appropriately colored.

In the third year the course includes, during the first session, the drawing of machines, mills, furnaces, etc., from plane models. These are shaded, their shadows calculated and cast, and the whole properly colored. The dimensions are also quoted, so that these drawings serve as types of working drawings.

During the second session the students draw from various models in relief, chiefly furnaces and machines. They first make a free hand sketch from the relief, and upon it place the dimensions which they measure; subsequently they draw the finished representation in the academy to a proper scale, with shades, shadows, colors, and dimensions. This practice is of benefit in accustoming the student to take rapid sketches of established works upon which he may be required to report, or by which he may wish to direct himself.

CIVIL ENGINEERING

is taught during the third and fourth years. In the third year the course of instruction will include Surveying (theory and practice), Topography, Geodesic Operations for the Tracing of Maps, Hydrography, Strength of Materials, etc., to be followed by a course of instruction in General Engineering Statics, and a course of Roads and Bridges, etc., according to Mahan's Civil Engineering, which will be used as a text-book, with Vinton's Strength of Materials. The theory of surveying is taught, as is customary, by lectures; and a certain amount of practical work in the field is exacted.

The drawing will include maps, problems in stone cutting, and copies from models, plane and in relief.

During the vacation at the close of the second year, students will be required to prepare a memoir on street and steam railroad switches, to be handed in on or before November 1st, 1876.

In the fourth year the course will consist of lectures on Hydraulics, Pneumatics and Machines.

For graduation, students of the fourth year will execute the following memoir and project:

A Memoir on the working expenses of steam railroads on different gauges per ton mile, to be handed in on or before November 1st, 1876.

And on or before the 15th of April, 1877, the following:

Project for a Reservoir Dam.

A section representing the bed of a stream will be assumed, and a reservoir dam will be projected to support a maximum actual head of 50′ water. The stream is liable to sudden freshets—the gneiss on the right bank is good building stone. The material, the form, and the stability of the dam must be determined, and the construction represented in section and elevation and plan, showing the gate-house, waste wier, etc.

Finished drawings must also be made of the details of the gates, and of the derricks used for lifting and laying stone, if the dam is made of masonry.

A description of the operation from beginning to end will be submitted, embodying also all the calculations for the dimensions of the dam, the pumping and hoisting power required. All necessary dimensions will be applied in red on the drawings, without reference to any scale, vertical or horizontal.

Note.—The memoir and project must be written on paper 8 x 10, with a margin of one inch, and be illustrated by drawings made to scale on paper 24 x 36 inches in size.

MODERN LANGUAGES.

The design in this department is to teach the students how to read French and German scientific books with facility.

Instruction is given for three hours a week in each of these languages during the first year, and two hours a week during the second year. As the text-books employed in the class-room are altogether works on science, the students can acquire a sufficient vocabulary to enable them to use French and German authors in all the departments of the school.

No attempt is made to produce accomplished scholars in all branches of German and French literature, but attention is concentrated upon the immediate wants of the young men. In this way no time is lost, and the instruction becomes thoroughly practical.

GENERAL CHEMISTRY.

The First Class attend three exercises a week in General Chemistry throughout the year. It is intended to lay the foundation of a thorough knowledge of the theory of the subject preliminary to the practical instruction in the chemical laboratory. For this purpose the class is drilled upon the lectures, with free use of the best text-books. The students are expected to write out full notes, which must be exhibited to the Professor at the close of each session. At the end of the year the members of the class must pass a rigid examination before they can be admitted to a higher grade.

The second class also attend three times a week during the year, and receive instruction in Theoretical Chemistry, adapted to the wants of special scientific students. They are expected to keep full notes, to be exhibited at the end of the year.

The following is an outline plan of the courses of lectures delivered to the respective classes:

FIRST CLASS.

1. Introduction. 2. Oxygen and ozone. 3. Hydrogen and water. 4. Nitrogen, air, nitrogen mon-oxide. 5. Nitric acid and ammonia. 6. Carbon, carbon mon-oxide, carbon di-oxide. 7. Compounds of carbon and hydrogen; carbon and nitrogen. 8. Chlorine. 9. Hydrochloric acid and oxygen compounds of chlorine. 10. Bromine, iodine and fluorine. 11. Sulphur and sulphurous acid. 12. Sulphuric acid, hyposulphurous acid, and compounds of sulphur with hydrogen and carbon. 13. Silicon and boron. 14. Phosphorus and its compounds. 15. Arsenic, antimony, bismuth and venadium. 16. Introduction to the metals. 17. Potassium and its compounds. 18. Sodium and its compounds. 19. Lithium, rubidium, cæsium, ammonium salts. 20. Calcium, barium and strontium. 21. Aluminum, magnesium, zinc and cadmium. 22. Manganese, iron, cobalt, nickel, chromium and uranium. 23. Tin, titanium, molybdenum and tungsten. 24. Lead, thallium, copper, mercury and silver. 25. Gold, platinum and the platinum metals. 26. Introduction to organic chemistry. 27. Monatomic alcohol group. 28. Ethyl series. 29. Higher alcohols. 30. Compounds of alcohols with bases. 31. Products of the oxidation of alcohols. 32. Acetal compounds. 33. Diatomic alcohols. 34. Products of the oxidation of the glycols. 35. Cyanogen compounds. 36. Urea and uric acid. 37. Trivalent alcohols. 38. Saccharine bodies. 39. Fermentation. 40. Amylaceous bodies and gums. 41. Aromatic compounds. 42. Benzol series. 43. Aniline and rosaniline. 44. Indigo, naphthaline and anthracene. 45. Turpentines and camphor. 46. Alkaloids. 47. Organic coloring matters. 48. Albuminous substances. 49. Chemistry of vegetation.

SECOND CLASS.

1. Introduction. 2. General laws of chemical combination. 3. Chemical nomenclature. 4. Notation. 5. Discussion of ozone and antozone. 6. Hydrogenium; occlusion and diffusion of gases. 7. Dialysis and osmose. 8. Nitric anhydride and theory of acids. 9. Coal and oil gases, and theory of combustion. 10. Volume composition of hydrochloric acid by electrolysis. 11. Compounds of chlorine with oxygen, nitrogen and carbon. 12. Higher compounds of sulphur

with oxygen. 13. Compounds of sulphur with hydrogen, carbon, chlorine, bromine and iodine. 14. Selenium and its compounds. 15. Tellurium and its compounds. 16. Formula of silicates and silicated hydrogen. 17. Composition and reactions of the phosphates. 18. General principles of chemical philosophy. 19. Physical and chemical relations of atomic weights. 20. Atomic theory. 21. Variations of equivalency. 22. The doctrine of chemical affinity. 23. Chemistry of the metals. 24. Classification of the metals. 25. Metallic chlorides. 26. Metallic bromides, iodides, fluorides and cyanides. 27. Theory of oxygen salts. 28. Metallic sulphides, selenides and tellurides. 29. Monad metals. 30. Alkalimetry. 31. Dyad metals, begun. 32. Dyad metals, continued. 33. Dyad metals, continued. 34. Dyad metals, concluded. 35. Triad metals; tetrad metals, begun. 36. Tetrad metals, continued. 37. Tetrad metals, concluded. 38. Pentad metals. 39. Hexad metals, begun. 40. Hexad metals, concluded. 41. Introduction to organic chemistry. 42. Proximate and ultimate analysis. 43. Empirical and molecular formulas. 44. Classification of organic compounds. 45. Fatty group, series C_nH_{2n+2}. 46. Fatty group, series C_nH_{2n}. 47. Monatomic alcohols, begun. 48. Monatomic alcohols, concluded. 49. Vinous fermentation. 50. Ethylic ethers. 51. Metallic compounds of ethyl. 52. Propyl, butyl and amyl alcohols. 53. Hexyl, heptyl, octyl and nonyl alcohols. 54. Alcohols, series $C_nH_{2n+2}O_2$. 55. Polyethenic alcohols. 56. Triatomic alcohols. 57. Tetratomic, pentatomic and hexatomic alcohols. 58. Glucoses. 59. Glucosides. 60. Polyglucosic alcohols. 61. Anhydrides of polyglucosic alcohols. 62. Monatomic organic acids. 63. Acetates. 64. Palmitic, stearic and oleic acids. 65. Oxalic series, begun. 66. Oxalic series, concluded. 67. Triatomic and tetratomic acids. 68. Aldehydes and ketones. 69. Aromatic group, begun. 70. Aromatic group, continued. 71. Aromatic group, concluded. 72. Cyanides, begun. 73. Cyanides, concluded. 74. Amines, begun. 75. Amines, concluded. 76. Alkaloids, begun. 77. Alkaloids, concluded. 78. Amides. 79. Albuminous principles. 80. Animal fluids.

ANALYTICAL CHEMISTRY.

There is a laboratory devoted to Qualitative Analysis, another to Quantitative Analysis, and an Assay laboratory. These laboratories are provided with all the necessary apparatus and fixtures, and each is under the special charge of a competent assistant. Each student is provided with a convenient table, with drawers and cupboards, and is supplied with a complete outfit of apparatus and chemical reagents.

During the second year Qualitative Analysis is taught by lectures and blackboard exercises, and the student is required to repeat all the experiments at his table in the laboratory. Having acquired a thorough experimental knowledge of the reactions of a group of bases or acids, single members of the group or mixtures are submitted to him for identification. He thus proceeds from simple to complex cases till he is able to determine the composition of the most difficult mixtures. Constant use is made of the spectroscope in these investigations.

When the student shows, on written and experimental examination, that he is sufficiently familiar with Qualitative Analysis, he is allowed to enter the Quantitative laboratory.

During the third and fourth years Quantitative Analysis is taught by lectures and blackboard exercises, and the student is required to execute in the laboratory in a satisfactory manner a certain number of analyses. He first analyzes substances of known composition, such as crystallized salts, that the accuracy of his work may be tested by a comparison of his results with the true percentages.

These analyses are repeated till he has acquired sufficient skill to insure accurate results. He is then required to make analyses of more complex substances, such as coals, limestones, ores of copper, iron, zinc and nickel, pig iron, slags, technical products, etc.—cases in which the accuracy of the work is determined by duplicating the analyses, and by comparing the results of different analysts.

Volumetric methods are employed whenever they are more accurate or more expeditious than the gravimetric methods. In this way each student acquires practical experience in the chemical analysis of the ores and products which he is most likely to meet in practice.

STOICHIOMETRY.

Stoichiometry, the arithmetic of chemistry, is taught in a special course of lectures and blackboard exercises during the second session of the second year; and its practical applications are developed in lectures on quantitative analysis and assaying.

ASSAYING.

During the fourth year the student is admitted to the Assay laboratory, where he is provided with a suitable table and a set of assay apparatus; and where he has access to crucible and muffle furnaces, and to volumetric apparatus for the assay of alloys of gold and silver.

The general principles as well as the special methods of assaying are explained in the lecture room, and at the same time the ores of the various metals and their appropriate fluxes are exhibited and described.

The student is then supplied with the different ores, and is required to assay each ore in duplicate under the immediate supervision of the instructor.

To facilitate the assay of ores of the precious metals, a system of weights has been introduced, by which the weight of the silver or gold globule obtained shows at once, without calculation, the number of troy ounces in a ton of ore.

APPLIED CHEMISTRY.

The instruction in Applied Chemistry extends through the third and fourth years, and consists of lectures illustrated by experiments, diagrams and specimens.

The subjects discussed are:

I. Chemical manufacture: acids, alkalies and salts.

(1.) Sulphur, sulphurous acid, hyposulphites, sulphuric acid, bisulphide of carbon, etc.
(2.) Common salt, soda ash, hydrochloric acid, chlorine, binoxide of manganese, bleaching powder, chlorates, chlorimetry, etc.
(3.) Carbonate of potash, caustic potash, alkalimetry, acidimetry, etc.
(4.) Iodine, bromine, etc.
(5.) Sodium, aluminum, magnesium.
(6.) Phosphorus, matches, etc.
(7.) Nitrates of potash and soda, gunpowder, gun-cotton, nitro-glycerine, etc.
(8.) Ammonia salts.
(9.) Cyanides.
(10.) Alum, copperas, blue vitriol, salts of magnesia, baryta, strontia, etc.
(11.) Borates, stannates, tungstates, chromates, etc.
(12.) Mercury salts, silver salts, photography.
(13.) Electro-metallurgy.
(14.) Oils, fats, soaps, glycerine.
(15.) Pigments, paints, essential oils, resins, varnishes, inks.

II. Glass, porcelain, and pottery.

III. Limes, mortars, hydraulic cements, gypsum, lutes, putty, etc.

IV. Fuel and its applications.

V. Artificial illumination: candles, oils, and lamps, petroleum, gas and its products.

VI. Food and drink: water, milk, cereals, starch, bread, meat, tea, coffee, sugar, fermentation, wine, beer, spirits, vinegar, preservation of food, tobacco, etc.

VII. Clothing: textile fabrics, bleaching, dyeing, calico printing, paper, tanning, glue, india-rubber, gutta percha, etc.

VIII. Fertilizers: guano, superphosphates, poudrettes, etc.

IX. Disinfectants, antiseptics, preservation of wood, etc.

The third year students of 1876–77, in the course in Analytical and Applied Chemistry, will be required to hand in on or before November 1st,

A Memoir on one of the following subjects: (1.) On a Rational Classification of Organic Compounds. (2.) On the Decompositions and Transformations of

Organic Compounds. (3.) On the Additive and Substitution Products of Benzole, (C_6H_6). The fourth year students in the same course will be required to hand in on or before the 1st of November,

A Memoir on one of the following subjects: (1.) Sulphuric Acid. (2.) Bisulphide of Carbon. (3.) Silver and Nickel Plating. (4.) Paints and Pigments.

And on or before the 16th of April, 1877, the following:

Chemical Dissertation on a subject which they may select, subject to the approval of the President and the Professors of General Chemistry and Analytical and Applied Chemistry.

NOTE.—These memoirs and dissertations must be written on paper 8x10, with a margin of one inch, and be illustrated by drawings made to scale on paper 24x36 in. in size, and accompanied, when possible, by specimens.

MINERALOGY.

The studies of the department of Mineralogy continue through the second and third years. In the second year the students are instructed in Crystallography and in the use of the Blowpipe. The lectures on Crystallography are illustrated by models, which the students are required to determine under the eye of the Professor. A collection of glass models, and of models in wood, illustrating all the important actual and theoretical forms, is always accessible to the students. The exercises in blowpipe determination are entirely practical. Known mixtures are first given to the student to examine, and, when he is sufficiently familiar with them, unknown mixtures are determined.

In the third year the lectures are illustrated by conferences, where the student is required to determine minerals by their physical and blowpipe characters, and in the case of the metallic minerals, to determine their constituents. The student thus obtains a thorough knowledge of both Qualitative and Quantitative Blowpipe Analysis. The mineralogical cabinet contains about 10,000 specimens in glass cases, which are labeled and open to the public. Besides this there is a collection of about 2,000 specimens, to which the students have unrestricted access.

GEOLOGY.

The course of instruction in this department is as follows:

SECOND YEAR.

Botany and Zoology, as an introduction to Palæontology—lectures throughout the year.

During the vacation at the close of the second year, students pursuing the course in Geology and Natural History are required to prepare a memoir on one of the following subjects, to be handed in on or before November 1st:

(1.) Notes on the flora or fauna of any geographical district visited. (2.) Observations on the structure, distribution, and habits of any of our fresh water fishes. (3.) Catalogues and collections of mollusks inhabiting any lakes, rivers, or districts. (4.) Notes on the economy of observed insects. (5.) Notes on the various observed methods by which the seeds of plants are distributed.

THIRD YEAR.

Lithology: Minerals which form rocks and rock masses of the different classes —lectures and practical exercises.

Geology: Cosmical, Physiographic, and Historical—lectures throughout the year.

During the vacation at the close of the third year, students pursuing the course of Geology and Natural History are required to prepare a memoir on one of the following subjects, to be handed in on or before November 1st:

(1.) Report on the geology of any district visited, embracing: *a.* Topographical features and their cause. *b.* Surface geology. *c.* Sections of strata with lithological character, thickness, dip, strike, and fossils of each bed. Sketches of rock outcrops. *d.* Suit of specimens of rocks and fossils, rocks 3x4x1 inches.

(2.) Report on any special formation which may be examined, embracing: *a.* The geographical area of its outcrops. *b.* Its mineral character and origin of the material composing it. *c.* Sets and collections of its fossils. *d.* Reading of the history of its deposition.

(3.) Report on any examined deposit of ores or other useful minerals, as: *a.* The magnetic iron ores of New York and New Jersey—phenomena and history. *b.* The limonite ores of the Alleghany Belt—character of deposits and age. *c.* The zinc ores of Franklin or Friedensville. *d.* The chromic iron of the Alleghany Belt—where and how it occurs.

FOURTH YEAR.

Economic Geology: Theory of mineral veins; ores; deposits and distribution of iron, copper, lead, gold, silver, mercury, and other metals; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, etc.

Palæontology: Systematic review of recent and fossil forms of life—lectures throughout the year.

For graduation in the course of Geology and Natural History, students will be required to present, on or before the 16th of April, a dissertation on one of the following subjects:

(1.) The mesozoic sandstones of New Jersey and the Connecticut Valley; their geological phenomena, history and relations to the associated trap rocks.
(2.) The limonite iron ores of the Alleghany Belt; their phenomena, age, and origin—*i. e.*, where and how they occur; when and how they were deposited.
(3.) Eozoon Canadense: is it organic ?

NOTE.—These memoirs and dissertations must be written on paper 8x10 in., with a margin of one inch, and be illustrated by drawings made to scale on paper 24x36 in. in size, and accompanied, when possible, by specimens.

METALLURGY.

The Metallurgical course includes lectures on the preparation of fuels, construction of furnaces, the manufacture of metals, projects and estimates for the erection of metallurgical works. The lectures cover a period of two years, and discuss in detail the methods in use in the best establishments in this country and in Europe for the working of ores, with practical details of charges, labor and cost of erection, obtained from the most authentic sources. Special attention is given to ores of this country which are difficult to treat, and to the solution of practical problems which are likely to occur. The lectures are illustrated by models, drawings of furnaces, and by collections of metallurgical products obtained from works in this country and in Europe.

During the vacation at the close of the third year, students who pursue the course in Metallurgy will be required to prepare a memoir on one of the following subjects :

(1.) On a rational classification of Organic Compounds.
(2.) On the decomposition and transformations of Organic Compounds.
(3.) On the additive and substitution products of Benzole, (C_6H_6). To be handed in on or before November 1st.

PROJECTS.

The projects assigned to the students familiarize them with the method of making plans and estimates for the erection of works. The ore to be worked and the various conditions which are required are given to the student at the close of the third year. During the summer vacation he is expected to visit works, and to ascertain what the practical requirements are. During the fourth year the drawings, estimates, and descriptions of the processes are completed, and submitted for inspection and approval.

The following memoir and project will be executed by the students who graduate in 1877 in the course of Metallurgy :

A Memoir on one of the following subjects, to be handed in on or before November 1st, 1876 :

(1.) Regenerative Furnaces. (2.) Blair's Direct Process. (3.) The Siemens-Martin's Process.

And on or before the 16th of April, 1877, the following:

Project for an establishment to treat annually 13,000 tons of Gold ore, containing on an average 15 grammes of Gold and 160 grammes of Silver to the 100 kilogrammes, 6% of Copper, 10% of Lead, and from 3 to 10% of Zinc. The principal gangues of the ore to be Iron pyrites and Quartz. The works are to be situated at some point within the United States where such ores are found.

The Project will comprise :

I. A MEMOIR. II. ESTIMATES. III. DRAWINGS.

I. The Memoir will give the reasons for the location of the works, and a detailed description of the process. The Gold and Silver must be parted and delivered in bars of standard fineness. If the works are situated at a distance from the mines, the question of transportation and any other causes which have decided the location must be fully discussed.

II. The Estimates will give the cost of the buildings, furnaces, machines, and tools used. Detail sketches drawn to a scale should be introduced in text, for illustration, when a simple description would not be satisfactory. The cost of each operation must be given in full, and also detailed statements referred both to the ton of ore and to the ton of bullion produced. A statement must be made of all the salable products made by the works, and an inventory of all tools, machines, and furnaces owned by the works must be made. The works must have a sinking fund; a percentage for its establishment must be charged to the bullion and other products. The sales will be made for cash or at six months' credit. The prices of material will be taken as they rule in the district chosen for the works during the period from June to October, 1876.

III. The Drawings will include :

1st. Plan of the works, showing the position of all the buildings, furnaces, and machines connected with it.

2d. An elevation and horizontal and vertical sections of the fusion furnace.

3d. Details, sections, and views of the refining furnaces.

4th. Plans, elevations, and sections of the silver works.

5th. Plans, elevations, and sections of the parting works.

NOTE.—These memoirs and projects must be written on paper 8x10, with a margin of one inch, and be illustrated by drawings made to scale on paper 24x36 inches in size.

MINING ENGINEERING.

Mining Engineering is taught during the third and fourth years. The instruction comprises a course of lectures illustrating the theory and practice of mining operations at home and abroad ; giving the general principles of reconnoitering and surveying mineral property and mines ; the attack, development, and administration of mines, and the mechanical preparation of ores, with the exhibition and use of all necessary reconnoitering and surveying instruments, particularly the mining theodolite, and the exhibition of various models.

In surveying, the student is taught to make surface and subterranean surveys, to direct and adjust his works ; also the solution of some problems of underground surveying by descriptive geometry, and many special examples of determining lines on the surface corresponding to given lines below, etc.

Attack describes the miners' method ; the use of drills, picks, powder, nitroglycerine and new explosives, compressed air, etc.; the proper location and construction of tunnels, slopes, shafts, wells for sounding, artesian wells, salt and oil wells ; preceded by a theory and description of the most typical veins, true or irregular, and other deposits of ore, salt, coal and oil, exemplified at home and abroad.

Development includes the description of the best methods in experience of laying out subterranean works for production and conservation in the present and future ; for proper and economic ventilation, transportation, hoisting, pumping or draining, distribution of workmen, etc. The lectures are illustrated by models of ventilating blowers, both exhaust and pressure, hoisting cages and machinery, man-engines, boring tools, etc., etc., belonging to the department.

Administration includes a review of the foregoing, with regard to a concentration of ideas and a general comparison of production cost to market price of untreated ore.

Here the student is taught to forecast the expense of the establishments he must make ; their annual cost ; the cost of miners, employees, machines, material, etc. ; and offset these with the result of production, so endeavoring to solve the problem of making a given mine pay in given circumstances, by scientific attack, distribution and general rational economy.

Mechanical preparation describes the various accepted methods of reducing massive ore to a condition either yielding metal or fitting the material for metallurgical processes. Models of stamps, crushers, shaking tables, sluices, etc., are exhibited, with plans and sections of mills, and coal-breakers at home and abroad.

During the vacation at the close of the second year, students pursuing the course of Mining Engineering will be required to prepare a memoir on the Preservation of Timber, to be handed in on or before November 1st, 1876.

For graduation in 1877 in the course of Mining Engineering, fourth year students will execute the following memoir and projects :

A Memoir on Mining Pumps, to be handed in on or before November 1st, 1876.

And on or before April 15, 1877, the following Projects :

I. Metallurgical Project: Identical in subject with the one specified for graduation in the course in Metallurgy.

II. Mining Project: The subjoined Geological Section overlying the Coal Measures will be assumed, and the project will describe the Sinking of a Vertical Shaft through the Strata as far as the Coal:

Geological Section:

Sand	4	metres.
Calcareous tufa	6	"
Compact limestone	20	"
Chalk with flints, very permeable (2,000 cu. m. p. 24 h.; head, 25 m.)	10	"
Blue clay	5	"
Fissured limestone, permeable (1,000 cu. m. p. 24 h.; head, 30 m.)	5	"
Blue clay	3	"
Fissured limestone, permeable (1,500 cu. m. p. 24 h.; head, 35 m.)	7	"
Shale	40	"
Pudding, etc		
Coal.		

There are three artesian levels to be perforated, and the shaft must be tubbed from the coal to the surface. It may be tubbed either with wood or iron. The entire operation of tubbing must be described. The dimensions of the frames or panels calculated, and the joints, picketing, backing of beton, illustrated in a vertical section of the completed shaft. The number, the character, the establishment of the pumps will be particularly described, and complete drawings in elevation and vertical sections of the entire lift will be demanded. The shaft may be four metres in diameter, and round or polygonal, according as iron or wood is chosen for the revetment. The section of the pumps and shaft may be made in one broken drawing, but dimensions must be legibly and abundantly applied in red, without any reference to a scale. The volume and pressure of water at different points is given in the geological section appended.

Note.—These memoirs and projects must be written on paper 8x10, with a margin of one inch, and be illustrated by drawings made to scale on paper 24x36 inches in size.

MACHINES.

The course of Machines, which is inseparable from that of Mining Engineering, is given during the fourth year. It teaches the theory of the machines used in mining works. It is the application of mechanics to the construction of water wheels, turbines, wind-mills, steam and heat engines, pumps and ventilators, transmission of force by compressed air, and the formulæ with their theory for the resistance of materials. Models of water wheels, steam-cylinders, steam engines, blowing machines, etc., are exhibited, and the lectures on the management of the steam engine are accompanied by practical manipulation by the students of a five-horse power engine, added this year to the collections of the Engineering department.

In the resistance of materials, the calculations are shown for the sections of different parts of machines, the fly wheel, pump rods, connecting rods, etc., also for such constructions as retaining walls, arches, timbering, supports, etc. The course of the fourth year also includes a plan of drawing and estimates for some projected work of mining, or the construction of a machine for some of the uses of mining. The system of projects is to the young engineer a real practical application of all his three years' study, by which he is made to investigate prices, compare theories, models, methods, and dispositions, and in competing with his class, to take pains to furnish the best arguments, illustrations, and calculations he can, in order to support his views.

VACATION WORK.

MEMOIRS.

During the vacations, at the close of the second and third years, students will be required to prepare memoirs on subjects assigned to them by the Faculty. These are to be handed in on or before November 1st.

These memoirs must be based upon the personal examination of works in actual operation. They must be written on paper 8x10 in., with a margin of one inch, and be illustrated by drawings made to scale on paper 24x36 in. in size, and accompanied, when possible, by specimens, which should be at least 3x4 in. in size, and labeled. Mention must be made of works visited and books consulted.

As the memoirs are bound in volumes for preservation at the School, whole (not half) sheets of paper should be used, and no holes should be made for ribbon or other fastenings.

The following subjects for memoirs were assigned for the vacation of 1876 :

For Students who had Completed the Second Year.

1. Those pursuing the course in Civil Engineering: Street and Steam Railroads.

2. Those pursuing the course in Mining Engineering: The Preservation of Timber.

3. Those pursuing the course in Metallurgy, one of the following subjects : On a rational classification of Organic Compounds ; on the decompositions and transformations of Organic Compounds ; on the additive and substitution products of Benzole.

4. Those pursuing the course in Geology and Natural History, one of the following:

(1.) Notes on the flora or fauna of any geographical district visited. (2.) Observations on the structure, distribution, and habits of any of our fresh water fishes. (3.) Catalogues and collections of mollusks inhabiting any lakes, rivers or districts. (4.) Notes on the economy of observed insects. (5.) Notes on the various observed methods by which the seeds of plants are distributed.

5. Those pursuing the course in Analytical and Applied Chemistry, one of the following: On a rational classification of Organic Compounds; on the decompositions and transformations of Organic Compounds; on the additive and substitution products of Benzole.

For Students who had Completed the Third Year.

1. Those pursuing the course in Civil Engineering: The working expenses of Steam Railroads on different gauges per ton mile.
2. Those pursuing the course in Mining Engineering: Mining Pumps.
3. Those pursuing the course in Metallugy, one of the following: (1.) Regenerative Furnaces. (2.) Blair's Direct Process. (3.) The Siemens-Martin's Process.

4. Those pursuing the course in Geology and Natural History, one of the following:

(1). Report on geology of any district visited; embracing: *a.* Topographical features and their cause. *b.* Surface geology. *c.* Sections of strata, with lithological character, thickness, dip, strike, and fossils of each bed; sketches of rock outcrops. *d.* Suit of specimens of rocks and fossils, rocks 3x4x1 inches.

(2.) Report of any special formation which may be examined; embracing: *a.* The geographical area of its outcrops. *b.* Its mineral character, and origin of the material comprising it. *c.* Sets and collections of its fossils. *d.* Reading of the history of its deposition.

(3.) Report on any examined deposits of ores or other useful minerals, as: *a.* The magnetic iron ores of New York and New Jersey, phenomena and history. *b.* The limonite ores of the Alleghany Belt, character of deposits and age. *c.* The zinc ores of Franklin or Friedensville. *d.* The chromic iron of the Alleghany Belt, where and how it occurs.

Those pursuing the course in Analytical and Applied Chemistry, one of the following: (1.) Sulphuric Acid. (2.) Bisulphide of Carbon. (3.) Silver and Nickel Plating. (4.) Paints and Pigments.

TEXT-BOOKS.

Books preceded by an asterisk (*) are optional—the others indispensable.

FIRST CLASS.

Peck's Manual of Algebra.
Peck's Manual of Geometry.
Ganot's Principles of Physics.
Roscoe's Chemistry, English edition.
Schlegel's First German Book.
Schoedler's Buch der Natur, Part I.
Jewett's Ollendorff's French Grammar.
Montmahou's Cours d'Histoire Naturelle.

SECOND CLASS.

Fownes' Elementary Chemistry, English edition.
Peck's Analytical Geometry.
Peck's Differential and Integral Calculus.
Davies' Descriptive Geometry.
Davies' Shades and Shadows.
Mahan's Stone Cutting.
Fresenius' Qualitative Analysis (new system.)
Plattner's Blowpipe Analysis.
Egleston's Diagrams of Crystals.
Gray's Lessons in Botany.
*Gray's Manual of Botany.
Nicholson's Manual of Zoology,
Schoedler's Buch der Natur, Part II.
Fasquelle's French Grammar.
Beudant's Geologie.

THIRD CLASS.

Peck's Mechanics (new edition.)
Mahan's Civil Engineering (revised by Wood.)
Johnson's Fresenius' Quantitative Analysis.
Dana's Manual of Geology.
*Wagner's Chemical Technology.
*Kerl's Metallurgy.
Plattner's Blowpipe Analysis.
Egleston's Lectures on Mineralogy.
Egleston's Tables for Determining Minerals.
Egleston's Metallurgical Tables.
Egleston's Tables of Weights, Measures, Coins, etc.
*Cotta's Lithology.
Vinton's Strength of Materials.
Davies' New Surveying.
J. W. Davis' Formulæ for the Calculation of Railroad Excavation and Embankment.

FOURTH CLASS.

*Burat's Geologie Appliqué.
*D'Orbigny's Paleontologie Elementaire.
*Mitchell's Manual of Practical Assaying.
*Whitney's Metallic Wealth of the U.S.
*Kerl's Probirkunst.
Egleston's Metallurgical Tables.
*Cotta's Treatise on Ore Deposits, by Prime.
Vinton's Notes on Machines.

GENERAL INFORMATION.

VACATIONS.

There is a recess in December, an intermission for examinations in February, and a vacation from the last Wednesday in June to the first Monday in October.

EXCURSIONS.

During the session the students may visit the different machine shops and metallurgical establishments of the city and its environs.

During the vacation each student is expected to visit mines, metallurgical and chemical establishments, and to hand in, on his return, a memoir on some subject assigned him. He is also required to bring collections illustrating his memoir, which collections are placed in the museum, reserved as a medium of exchange, or made use of in the laboratories.

LIBRARY.

A special Scientific Library has been provided for the use of the students of the School, which already numbers more than seven thousand volumes, and is rapidly increasing. The following periodicals are regularly received:

Abhandlungen der Kaiserlichen Königlichen Geologischen Reichsanstalt; *Wien.*
American Association, The Reports of the.
American Chemist; *New York.*
American Gaslight Journal; *New York.*
American Journal of Science; *New Haven.*
Annalen der Chemie und Pharmacie, *Liebig und Wöhler; Leipzig und Heidelberg.*
Annalen der Physik und Chemie, *Poggendorff; Berlin.*
Annales de Chimie et de Physique; *Paris.*
Annales des Mines; *Paris.*
Anthony's Photographic Bulletin.

Archiv für Mikroskopische Anatomie; *Bonn.*

Berg und Hüttenmännisches Jahrbuch; *Wien.*

Berg und Hüttenmännische Zeitung; *Leipzig.*

Berichte über die Fortschritte der Eisenhütten-Technik; *Leipzig.*

Berichte der Deutschen Gesellschaft zu Berlin.

Bibliotheca Historico-Naturalis; *Göttingen.*

British Association for the Advancement of Science. Reports; *London.*

British Journal of Photography.

Bulletin of the American Iron and Steel Association; *Philadelphia.*

Bulletin de la Soc. Ind. de Mulhouse.

Bulletin du Musee de l'Industrie; *Bruxelles.*

Bulletin de la Societe Geologique de France; *Paris.*

Bulletin de la Societe de l'Industie Minerale; *Paris.*

Bulletin Mensuel de la Societe Chimique de Paris.

Canadian Naturalist and Geologist; *Montreal.*

Chemical News; *London.*

Chemisch-Pharmaceutisches Central-Blatt; *Leipzig.*

Chemische Technische Mittheilungen, *Elsner; Berlin.*

Comptes Rendus de l'Academie des Sciences; *Paris.*

Department of Agriculture. Monthly Reports; *Washington.*

Engineering; *London.*

Engineering and Mining Journal; *New York.*

Geological Magazine; *London.*

Hardwicke's Science Gossip; *London.*

Iron Age; *New York.*

Industrie Blätter, *Hager u. Jacobsen; Berlin.*

Jahrbuch der Kaiserlichen Königlichen Geologischen Reichsanstalt; *Wien.*

Jahresbericht über die Fortschritte der Chemischen Technologie, *Prof. J. R. Wagner; Leipzig.*

Jahresbericht über die Fortschritte der Chemie; *Giessen.*

Journal of the Chemical Society; *London.*

Journal für Practische Chemie: *Leipzig*

Journal of the Franklin Institute; *Philadelphia.*

Journal of Gas Lighting; *London.*

Journal of the Geological Society of Dublin.

Journal of the Geological Society of Edinburgh.

Journal of the New York Academy of Sciences.

Journal of the Iron and Steel Institute; *London.*

Journal des Mathematiques; *Paris.*

Journal de Pharmacie et de Chimie; *Paris.*

Le Moniteur Scientifique, du *Quesneville*; *Paris.*

Le Technologiste; *Paris.*

Les Mondes; *Paris.*

Manufacturer and Builder; *New York.*

Mineralogische Mittheilungen; *Wien.*

Monthly Microscopical Journal; *London.*

Monthly Reports of the Director of the Bureau of Statistics; *Washington.*

Nature; *London.*

Neues Jahrbuch für Mineralogie, Geologie und Palæontologie; *Stuttgart.*

New York State Agricultural Society Journal; *Albany.*

Oesterreichische Zeitschrift für Berg und Hüttenwesen; *Wien.*

Palæontographical Society; *London.*

Philosophical Magazine; *Edinburgh and London.*

Photographische Mittheilungen; *Berlin.*

Polytechnisches Central-Blatt; *Leipzig.*

Polytechnisches Journal, *Drn. J. G. und E. M. Dingler; Augsburg und Stuttgart.*
Polytechnisches Notizblatt; *Mainz.*
Popular Science Monthly; *New York.*
Popular Science Review; *London.*
Proceedings of the Essex Institute; *Salem, Mass.*
Quarterly Journal of Science; *London.*
Quarterly Journal of the Geological Society; *London.*
Revue des Cours Scientifiques; *Paris.*
Revue Universelle des Mines, de la Metallurgie, etc.; *Paris.*
Scientific American; *New York.*
Smithsonian Institute Reports; *Washington.*
Smithsonian Miscellaneous Collections; *Washington.*
The Commissioners of Patents Journal; *London.*
The Technologist; *New York.*
The Textile Colourist; *London.*
United States Patent Office Gazette.
Van Nostrand's Eclectic Engineering Magazine; *New York.*
Verhandlungen der K. K. Geologischen Reichsanstalt; *Wien.*
Zeitschrift für Chemie; *Leipzig.*
Zeitschrift der Deutschen Geologischen Gesellschaft; *Berlin.*
Zeitschrift des Vereines Deutscher Ingenieure; *Berlin.*
Zeitschrift für Analytische Chemie, *Dr. O. R. Fresenius; Wiesbaden.*
Zeitschrift für das Berg-Hütten und Salinenwesen in dem Preussischen Staate; *Berlin.*

CABINETS.

Collections of specimens and models, illustrating all the subjects taught in the School, are accessible to the students, including:

Crystal Models,
Natural Crystals, Pseudomorphs,
Ores and Metallurgical Products,
Models of Furnaces,
Collection Illustrating Applied Chemistry,
Fossils,
Economic Minerals,
Rocks,
Models of Mining Tools,
Olivier's Models of Descriptive Geometry,
Models of Mining Machines.

COLLECTIONS IN THE DEPARTMENT OF MINERALOGY AND METALLURGY.

Crystal Models.—The lectures on Crystallography are illustrated by a collection of 150 models in glass, which show the axes of the crystals and the relation of the derived to the primitive form. This suit is completed by 400 models in wood, showing most of the actual and theoretical forms.

Minerals.—The cabinet of minerals comprises about 10,000 specimens, arranged in table cases. It includes a large suit of pseudomorphs, and a collection illustrating Crystallography by natural crystals, showing both their normal and distorted forms. The minerals are accompanied by a large collection of models in wood, showing the crystalline form of each. Arranged in wall cases are large specimens, showing the association of the minerals.

The greater part of this valuable collection was presented to the School by Governeur Kemble, and R. P. Parrott, of Cold Spring, N. Y., and G. T. Strong, W. H. Aspinwall, Morris K. Jesup, D. S. Egleston, John Caswell, W. E. Dodge, Jr., Chas. Lanier, and J. Crearer, of this city.

Ores and Metallurgical Products.—A very complete collection of metallurgical products, illustrating the different stages of the type process in use in the extraction of each metal in this country and Europe, is accessible to the students. This collection is constantly increasing. Most of the specimens have been analyzed and assayed.

Models of Furnaces.—An extensive collection of models of furnaces has been imported from Europe. A very large number of working drawings of furnaces and machines used in the different processes are always accessible to the students.

COLLECTION ILLUSTRATING APPLIED CHEMISTRY.

Several thousand specimens of materials and products illustrating Applied Chemistry are arranged in a cabinet of industrial chemistry, for the illustration of the lectures and inspection of the students.

GEOLOGICAL COLLECTION.

This consists of over 60,000 specimens (to which additions are constantly made), forming the following groups:

1st. A systematic series of the rocks and fossils characteristic of each geological epoch, numbering over 20,000 specimens.

2d. A collection of ores, coals, oils, clays, building materials, and other useful minerals, illustrative of the course of lectures on Economic Geology, and believed to give the fullest representation of our mineral resources of any collection yet made.

3d. A collection of 5,000 specimens of rocks, and the minerals which form rocks, to illustrate the lectures on Lithology.

4th. A Palæontological series, which includes collections of recent and fossil vertebrates, articulates, mollusks, radiates and plants. In this series is to be found the largest collection of fossil plants in the world, including many remarkably large and fine specimens, and over 200 new species of which representatives are not known to exist elsewhere. Also, the most extensive series of fossil fishes in the country, including, among many new and remarkable forms, the only specimens known of the gigantic *Dinichthys;* a suit of Ward's casts of extinct saurians and mammals ; a fine skeleton of the great Irish elk, etc., etc.

COLLECTIONS IN THE DEPARTMENT OF ENGINEERING.

Civil Engineering is illustrated by a collection of models of beams, beam joints, roof and bridge trusses, masonry doorways, arches, walls, culverts, bridges and canal locks; working models of overshot, breast, undershot and different kinds of turbine water-wheels; horizontal, vertical, and sectional steam engines and valves, etc.

Mining Engineering is illustrated by models of blowing engines, ventilators, mine shafts, tunnels, galleries, methods of walling, methods of tubbing shafts, methods of measuring shafts, shaft house, hoisting engine, safety cages, man-engines, ladders, shaking tables, washers, stamps, crushers, mining machines, lamps and tools, artesian well borer, blasting apparatus, etc.

Machine for Testing the Strength of Materials.—The machine is constructed to apply and accurately to weigh strains of from 5 to 50,000 lbs. It may be readily adjusted to specimens of a great variety of sizes and shapes, and it is in general applicability and delicacy of determination one of the most perfect machines of the kind ever made. The School will conduct series of experiments to obtain results which will be of value to all engineers and constructors, particularly in consideration of American irons, for which the public interest now demands more special and extended tables.

This scale was made for the School by Fairbanks & Co., and is designed for testing the strength of metals, such as boiler and bar irons; building materials in various forms, as stone, brick, cement, etc.; and it may be used in any case where it is desirable to enter the exact number of pounds required to deflect, crush, or break any substance.

The scale is composed of a series of multiplying levers, having a beam similar to the ordinary platform scale. It also has a combination of gears and screws so arranged that by turning a hand-wheel the pressure or strain is applied to the platform through the specimen which is being tested. This, of course, causes the beam to rise, when, by an arrangement of clock-work, the poise is moved to a point on the beam indicating the number of pounds strain or pressure on the specimen. When this point is reached, the beam drops and the poise remains at the point where it is when the beam commences to fall. If more strain is then applied, the beam again rises and the poise moves on as before, and so on, until the specimen is crushed or broken, when the figures on the beam at which the poise stops indicate the exact number of pounds strain or pressure at which the specimen gave way. A vernier scale, reading to hundredths of an inch, gives the amount of linear deflection, compression or tension, to which the specimens are submitted.

Steam Engine.—A five-inch steam engine, with a stroke of six inches, made by the New York Safety Steam Power Co., has been recently added to the collections of the Engineering department. It is of the condensing type. The valve is operated by a link motion. The engine is fitted with thermometer and steam gauge on the chest to determine losses of heat and pressure in the connections, with a vacuum gauge on the condenser, and has appliances for connecting an indicator upon both ends of the cylinder. Students will be instructed in the practical use of the parts, setting the valve, etc., and will be required to solve some of the problems presented in steam engineering, interpreting indicator diagrams, which they will take under varying conditions, evaluating losses of heat, etc., etc. They will also learn the use of the friction dynamometer in determining variations in efficiency, the best velocity for different engines, and will investigate other problems in that field of inquiry.

Drawing Models.—There are, for the use of students, a large collection of flat models and of plaster casts ; the Olivier models, forming all mathematical surfaces by silk threads, and admitting of a variety of transformations ; also, other models, illustrating general and special problems of descriptive geometry, shades and shadows, and stone cutting ; drawings of machines and parts of machines for studying and copying ; also, landscapes, in crayon and in water color, for instruction in sketching ; models of mining machines and mining tools, stationary steam engines, single and double cylinders, sections of steam cylinders, water wheels, turbines, shaking tables, stamps, crushers, blowing machines, pumps, etc.

ASTRONOMICAL OBSERVATORY.

The Astronomical Observatory includes a set of portable astronomical instruments ; a forty-six inch transit, by Troughton & Simms ; an equatorially mounted refractor of five inches aperture, to which is attached a spectroscope with the dispersive power of thirteen flint-glass prisms of fifty-five degrees, by Alvan Clarke.

A set of comparison apparatus, with electrodes, Plücker's tubes, coil, etc., accompanies the spectroscope.

Instruction in Practical Astronomy is given in the Observatory to such students of the third and fourth classes as may desire it.

TORREY PRIZES.

A friend of the School offers a prize of fifty dollars to the student of the first year who passes the best written and experimental examination in Qualitative Analysis.

And fifty dollars to the student of the School who gives evidence of the most thorough knowledge of the theory and practice of Assaying.

These prizes are called the Torrey Prizes, in honor of the late Dr. John Torrey.

DEGREES.

Those who complete the required course of studies will receive the degree of Engineer of Mines, Civil Engineer, or Bachelor of Philosophy.

Graduates of the School who pursue for one year a course of study prescribed by the Faculty, and present an acceptable dissertation embodying their results, receive the degree of Doctor of Philosophy.

EXTRACTS FROM THE BY-LAWS.

4. No student who shall have entered as a regular student shall be permitted to transfer himself to the class of special students, without a vote of the Faculty, after satisfactory cause shown.

5. Any student, special or regular, who shall be found on examination seriously deficient in any branch of study, may be required to study under a private tutor the subject or subjects in which he is deficient, and to pass a rigorous examination upon the same, failing or declining which he shall be dropped from the roll.

6. No regular student who, after the beginning of the final year of the course, shall be found not to have made good all the deficiencies previously recorded against him, shall be any longer a candidate for a degree, unless reasons shall appear satisfactory to the Faculty to account for his failure.

8. No students admitted to special courses shall be permitted to attend exercises with the first class.

9. Special students shall be held to the same periodical or occasional examinations which are required of regular students pursuing the same branches of study; and for inattention to study or practice, or for lack of proficiency, shall be liable at any time to be dropped from the roll.

ATTENDANCE.

11. Prompt attendance upon all the exercises of the School will be required.

12. Any student who, being present at the School, shall absent himself from any exercise at which his attendance is due, shall be liable to removal from the roll of his class.

13. Any student who shall leave the College grounds, thereby failing to be present at any exercise at which his attendance is due, without permission of the President or the Dean of the Faculty, shall be liable to be dismissed from the School.

14. No student who shall absent himself from more than one-fourth of the lectures and recitations on any subject, shall be entitled to an examination in that subject.

15. Candidates for a degree may, by a vote of the Faculty, be excused from attending studies of the course which they have pursued elsewhere, on passing satisfactory examinations upon the same.

16. Any student who shall have passed a satisfactory examination in the Academic Department of Columbia College, in any study forming a part of the regular course in the School of Mines, will not be required to pursue that study in the School.

17. No special student shall attend the lectures in any department until he shall have reported his intention to do so to the head of that department, and he shall then be subject to all the rules and regulations applied to the candidates for a degree.

18. Special students will be required to attend the following course of lectures:

1. Those in the Qualitative Laboratory, the lectures on General Chemistry, Qualitative Analysis, and Stoichiometry.

2. Those in the Quantitative Laboratory, the lectures on General Chemistry, Stoichiometry, Quantitative Analysis, Assaying, and Applied Chemistry.

3. Those in Mechanics or Physics, the regular course in Mathematics.

4. Those in Drawing, the lectures on Descriptive Geometry and Shades and Shadows.

EXAMINATIONS.

19. Examinations on the subjects in which instruction has been given in the School will be held at the close of the first term, or at the end of the year.

20. No student who shall absent himself from a regular examination shall be allowed to proceed without a special vote of the Faculty.

21. Students who do not pass a satisfactory examination will be permitted to present themselves for a second trial during the first week after the ensuing summer vacation. The time cannot be extended without a special vote of the Faculty.

22. Examinations at times other than here designated will not be held except by order of the Faculty.

23. Students deficient in any department will not be allowed to go on with their classes without a special vote of the Faculty.

24. No student shall be entitled to a degree until he has passed satisfactory examinations in all the studies of the course in which he desires to graduate.

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Ueber Dinitroparadibrombenzole und deren Derivate. 12mo. Berlin, 1876.

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On an Easy Method of Producing Di-and Trinitrophenetol.

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Vol. II. Cretaceous Vertebrata. E. D. Cope. 4to. Washington, 1875.

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United States Geological and Geographical Survey of the Territories; Report of Progress for 1874. 8vo. Washington, 1876. Second Division, J. W. Powell, Geologist in Charge : Report on the Geology of the Eastern Portion of the Uinta Mountains and a Region of Country Adjacent Thereto. With Atlas. 4to. Washington, 1876.

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E. J. Hallock, A. M.—Index to the Literature of Titanium, from 1791 to 1875. (Manuscript.) Tozetti Jean Targioni. Voyage Mineralogique, Philosophique et Historique en Toscane. Tome II. 8vo. Paris, 1792.

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Nov. 7—Election Day—Holiday.
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Dec. 25—Christmas Holidays begin, Monday.
1877—Jan. 8—Lectures Resumed, Monday.
Jan. 26—First Session ends, Friday.
Feb. 15—Second Session begins, Thursday.
June 1—Second Session closes, Friday.
June 4—Annual Examination begins, Monday.
June 22—Examination for Admission, Friday.
June 27—Commencement, Wednesday.
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